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PUBLIC DOCUMENTS

OF THE

STATE OF CONNECTICUT.

VOL. IV—PART 2.

1912

PRINTED BY ORDER OF THE GENERAL ASSEMBLY

HARTFORD
1914

NOTE.

Commencing with the documents for the year 1900, a Document Number was assigned to each State departmental report.

This number was determined by the chronological order of the first printed independent issue of such report and will in future be retained by it, thus showing the relative chronological place it occupies in the printed reports of the State.

A list of these reports, with the date of first printed issue and the document number of each, appears on the following page.

Thomas D. Bradstreet.

Comptroller.

Oct. 1, 1912.

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3.	Governor's Message,	1817
4.	State Prison,	1828
5.	Bank Commissioners,	1838
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9.	Vital Statistics (first issued by Secretary of State),	1847
10.	Treasurer,	1852
11.	Connecticut School for Boys (Reform School),	1853
12.	Railroad Commissioners (see Public Utilities Commission, below),	1854
13.	State Librarian,	1855
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15.	Connecticut School for Imbeciles,	1862
16.	Manual and Roll (since 1907 in Register and Manual and Pocket Manual only),	1864
17.	Insurance Commissioner,	1866
18.	State Board of Agriculture,	1866
19.	Fish and Game Commissioners,	1867
20.	Connecticut Hospital for the Insane,	1867
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22.	Indebtedness, rate of tax, etc. (Quadrennial)	1874
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41.	Examiner of Public Records (formerly Commissioner of Public Records),	1900
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50.	Board of Control,	1906
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State of Connecticut
PUBLIC DOCUMENT No. 18.

FORTY-FIFTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Connecticut State Board of Agriculture

1912

PRINTED BY ORDER OF THE LEGISLATURE

HARTFORD
PUBLISHED BY THE STATE
1913

PUBLICATION
APPROVED BY
THE BOARD OF CONTROL.

The Evans Brothers, PRINTERS, Putnam, Connecticut.

STATE OF CONNECTICUT
OFFICE OF THE
STATE BOARD OF AGRICULTURE
ROOM 62, CAPITOL.

TO HIS EXCELLENCY

SIMEON E. BALDWIN,

Governor of Connecticut.

SIR:—

In accordance with the provisions of the statute I have the honor, as Secretary of the State Board of Agriculture, to submit herewith the Report of the Board for the year ending December 31, 1912.

Very respectfully yours,

LEONARD HOLMES HEALEY,

Secretary.

NORTH WOODSTOCK, February 1, 1913.

STATE BOARD OF AGRICULTURE.

ORGANIZED 1866. REORGANIZED 1907.

1912.

HIS EXCELLENCY SIMEON E. BALDWIN, *ex officio.*

MEMBERS APPOINTED BY THE GOVERNOR AND SENATE.

		Term expires
GEORGE A. COSGROVE,	Willington,	July 1, 1913
LEONARD H. HEALEY,	North Woodstock,	July 1, 1913
WILSON H. LEE,	Orange,	July 1, 1915
W. C. SANFORD,	Bethel,	July 1, 1915

APPOINTED BY THE GENERAL ASSEMBLY.

Hartford County,	N. HOWARD BREWER, Hockanum,	1913
New Haven County,	D. WALTER PATTEN, North Haven,	1913
New London County,	JAMES B. PALMER, Norwich,	1913
Fairfield County,	J. ARTHUR SHERWOOD, Easton, P. O., Long Hill.	1913
Windham County,	EVERETT E. BROWN, Pomfret Centre,	1915
Litchfield County,	RICHARD E. DODGE, Washington,	1915
Middlesex County,	WILBUR L. DAVIS, Durham,	1915
Tolland County,	CHAS. A. THOMPSON, Melrose,	1915

OFFICERS OF THE BOARD.

GOVERNOR SIMEON E. BALDWIN, *President ex officio.*

WILSON H. LEE,	Orange,	*Vice-President.*
LEONARD H. HEALEY,	Woodstock,	*Secretary.*
CHAS. A. THOMPSON,	Melrose,	*Treasurer.*
Dr. E. H. JENKINS,	New Haven,	*Chemist.*
Dr. G. P. CLINTON,	New Haven,	*Botanist.*
Dr. W E. BRITTON,	New Haven,	*Entomologist.*
N. S. PLATT,	New Haven,	*Pomologist.*

Executive Committee.

D. W. PATTEN, J. B. PALMER, R. E. DODGE.

Auditors.

JAMES B. PALMER, D. WALTER PATTEN RICHARD E. DODGE.

CONNECTICUT
STATE BOARD OF AGRICULTURE.

The Connecticut State Board of Agriculture was established by act of Legislature, holden in New Haven on the first day of May, 1866. Said act provided that the Board should consist of the Governor, one person appointed from each county by the incorporated agricultural societies in each county, receiving an annual bounty from the State, and four other persons appointed by the Governor, with the advice and consent of the Senate.

This Board was empowered to receive and hold donations or bequests for promoting agricultural education and the general interests of husbandry; to prescribe forms for and regulate the returns required from agricultural societies.

The secretary was required by statute to visit different sections of the State annually, for the purpose of inquiring into the methods and wants of practical husbandry, ascertaining the adaptation of agricultural products to soil, climate, and markets, encouraging the establishment of agricultural libraries and reading rooms, and disseminating agricultural information by lectures or otherwise.

For the purpose of preventing the spread of contagious diseases among domestic animals, the Board could prohibit the introduction of any such animals into the State, and could quarantine any infected animal in the State. The Board could also appoint three commissioners on diseases of domestic animals, having all the powers of the Board in regard thereto.

By act of the General Assembly of 1897, the Board was reorganized to consist of one member from each county of the State, elected by the Senators and Representatives of said counties respectively, and the power to investigate the contagious diseases of domestic animals was given to one commissioner, appointed by the Governor, with the advice and consent of the Senate.

The Legislature of 1899 amended this act by providing for the appointment of one member from each congressional district by the Governor, making the Board to consist of twelve members as formerly, with the Governor as president, *ex officio*.

Hon. Theodore S. Gold of West Cornwall was elected the first secretary in 1866, and was re-elected each year until July 1, 1901, when he was succeeded by Col. James F. Brown of North Stonington, who held the office until July 1, 1909, when he was succeeded by I. C. Fanton of Westport, who held the office until July 1, 1911, when he was succeeded by Leonard H. Healey of North Woodstock, the present secretary.

AGRICULTURE.

Agriculture dates back as far as ancient records. These records, which have come down to us from thousands of years before Christ, record the fact that Egypt was a land so rich and fertile that its dense population was more than supplied with corn produced within its own borders. Even in those times its farmers were conversant with rules and maxims that make for successful agriculture.

In this country agriculture was commenced by clearing the land and growing crops necessary for the sustenance of the settlers. In those earlier years land was so plentiful that it was much easier to "move on" than to strive for the retention of its fertility. There was no incentive for retention of soil fertility for rotation of crops and their careful cultivation, scarcely a motive to seek new ideas in regard to agricultural practices. A deep-seated prejudice among the masses was in evidence against book learning and all scientific teaching, as it related to agriculture.

During the last century, however, leaders of thought and men prominent in agriculture came to see that for many years, at least, agriculture must be one of the country's principal industries. Thus it was that a movement was begun to improve agricultural conditions. Departments of agriculture, experiment stations, agricultural colleges, fairs, and boards of agriculture were organized, these all, primarily, to foster the various farm interests. Farm interests in the United States alone now involve a capital of nearly twenty-eight billion dollars, and employ in their workings ten and one-half million persons. These figures are large, but they soon must be doubled, to furnish our rapidly increasing population. It not only means more acres cultivated, but a more intensive cultivation of those acres now producing crops.

The changed conditions of farming must be met. The virgin fertility of the soil has been so reduced that fertilizers and crop rotation must be intelligently used. Our dairy cows must produce not only milk of a certain percentage of butter fat, but they must also produce a certain number of thousand pounds each year, to give a profit to the producer. Many barns in our own and other States might be filled with high-grade cows that would double their owner's profits.

Selection, breeding, and the profitable production of farm crops necessitate down-to-date information along these various lines.

The raising of alfalfa and corn is a science by itself. Fruit raising, once profitable without care, now requires a scientific management. The professions of law, medicine, and the ministry are not the only ones that can make use of a college education. The practice of agriculture offers as great a field for scientific study and its practice as any other. To raise 100 bushels of potatoes to the acre; to maintain and pay the "up-keep" of cows that produce 3,500 pounds of milk each year; to raise fruit that is barely saleable,—all are farm drudgeries. Producing 300 bushels of potatoes to the acre; keeping cows that make 7,000 pounds of of milk per year; and raising *high-grade* fruit is *science* applied to farming. Many of our farmers are actually doing this; why are not more?

CONNECTICUT.

SURFACE, CLIMATE, AND SOIL.

Connecticut ranks forty-sixth in area and thirty-first in population among the States. The greater part of the State of Connecticut consists of rolling, mountainous highlands, interspersed by innumerable small valleys, and bordered toward the coast line by a low, rolling plateau.

The climate is like that of all the North Atlantic States, the four seasons well defined, and generally an abundant rainfall for all crops.

PRINCIPAL CROPS.

The leading field crops of the State in the order of their importance, as judged by value, are: hay and forage, $7,225,000; tobacco, $4,416,000; potatoes, $1,882,000; corn, $1,694,000; and oats, $161,000. By far the most important crop of the State in acreage and value is hay and forage, it being almost eight times as great in extent as corn, the second crop in acreage, and valued at more than 60 per cent above tobacco, the second crop in value. Potatoes, with an acreage of about 50 per cent above that of tobacco, show a value less than half as great. Corn, with an acreage a little more than double that of potatoes, is reported at 10 per cent less in value, while oats fall in acreage and value, respectively, to one-fifth and one-tenth of that of corn.

Corn gave an average yield in 1909 of 48 bushels to the acre, worth $32.13; oats 26.8 bushels, valued at $15.79; rye and buckwheat each yielded over 18 bushels an acre, worth $16.28 each; hay and forage averaged 1.37 tons per acre, or $18; potatoes 112 bushels an acre, or $78.56; and tobacco 1,752.3 pounds to the acre, worth $275.27.

Both fruit growing and truck gardening are very profitable industries in Connecticut, and yield handsome returns. It is a thickly settled State, and the gardner is always close to local markets, not to mention the always eager market of New York City, within a very few hours by rail.

STOCK RAISING.

The values of some of the various kinds of domestic animals and of poultry and bees, as reported by the census of 1910, were: cattle, $6,730,287; horses and colts, $5,739,400; swine, $472,741; sheep and lambs, $112,349; poultry, $988,653; bees, $41,839. The total value of all domestic animals, poultry, and bees in 1910 was $14,163,902. During the 10-year period, 1900-1910, domestic animals, poultry, and bees combined increased in value $3,232,000, or 29.6 per cent.

Of all farms 33 per cent report swine, the average number being nearly 6 per farm reporting.

The increase reported in the number of fowls on Connecticut farms during the past decade amounts to 15.2 per cent, while the value increased from $644,000 to $989,000, or 53.5 per cent. The number of farms reporting poultry increased only from 23,064 to 23,214, but the average number of fowls per farm reporting increased from 48 to 55.

Of all the farms in the State 79.5 per cent report cattle, 77.7 per cent report "dairy cows," and only 18.8 per cent "other cows." Only 471 farms have cattle without having dairy cows. The average value of dairy cows increased from $33.71 to $41.50 during the 10-year period, 1900-1910. The farms reporting dairy cows show an average of nearly 6 per farm.

PRICES OF FARMS AND INDUCEMENTS TO SETTLERS.

Over two-thirds of the State's total land area is in farms. In each county of the State from 60 to 80 per cent of all land is in farms. New London County shows the highest proportion, 75.5 per cent, of land in farms, while Middlesex County shows the smallest proportion, 63.4 per cent. The four northern counties show higher proportions of farm land than do the southern counties, New London excepted.

The average value per acre of farm land for the whole State is $33.03. In the eastern part of the State the value of farm land is from $10 to $25 per acre, while in Fairfield County, which is in the extreme southwestern part of the State, the average value is $75 to $100 per acre, or over two and one-half times as high as for the State as a whole. New Haven and Hartford Counties, located in the central part of the State, show an average value for farm land of from $25 to $50 per acre. The average value of a farm with its equipment in 1900 was $4,205, while 10 years later it was $5,944. The average value of land alone rose from $22.68 per acre in 1900 to $33.03 in 1910, this advance being accompanied by increases in the average value per farm of implements and machinery and of live stock.

FARM EXPENSES.

Over two-thirds of the farmers in Connecticut hire labor, and the average amount expended by those hiring is $383. About one-fifth of the amount expended for labor is in the form of rent and board, and the total amount expended is more than one and two-thirds times as great as that reported in 1900. About four-fifths of all Connecticut farms report some expenditure for feed, while about three-fifths report the purchase of fertilizer. There is a marked increase — 81.2 per cent — since 1899 in the total amount reported as paid for fertilizer, the average for those reporting being $125 per farm.

GENERAL AND SPECIAL INDUCEMENTS.

The nearness to markets makes dairying, and especially the production of milk, one of the leading industries of the State; and the adaptability of Connecticut's soil and climate to fruit raising makes this a profitable and growing occupation. The opportunities for those desiring to engage in dairying, poultry raising, or fruit culture are as good in Connecticut as in any other State in the Union; yet here, as elsewhere, a little capital, push, and energy are needed to insure success.

Connecticut's public schools, as well as her colleges, are noteworthy, and are well distributed through the rural districts. The State Board of Agriculture stands ready to aid and advise any who desire information in regard to the natural advantages and resources of the State. To assist and aid in the advancement of our State's agriculture and to create this desire in the minds of our many farmers are the endeavors of our State Board of Agriculture. With this thought foremost the Board has given of its energies along these lines.

FARM CIRCULARS.

So many requests were received asking for information about farms for sale that it was deemed best to prepare such a circular. Every farm listed on this first circular has been disposed of, and a much larger one prepared, and is now obtainable by those who desire this available information in regard to farms for sale. Scarcely a day passes but what we receive from five to a dozen requests for these circulars, coming from nearly every State in the Union. Our aim has been to secure those buyers who would make good citizens, and in this we have been most successful.

POTATO WARNING.

The scarcity of good seed potatoes and the prices quoted for them created a tendency among the farmers to use foreign seed. Knowing the danger from the use of such foreign seed, the following postal card was prepared and mailed to a large number of our potato raisers:

Large quantities of foreign-grown potatoes are being received in this country. Their very fine appearance and reasonable cheapness, in comparison to home-grown, are strong temptations for many of our farmers to use them for seed. *Don't do it!* In testing more than one hundred (100) varieties our National Department has proven that they do not equal home-grown seed as producers. *The great danger* however is in introducing several new diseases as yet unknown here.

The most dreaded is the "Wart Disease." Bulletin No. 52 of the Bureau of Plant Industry and Farmers' Bulletin 489 of the Department of Agriculture, Washington, fully describe the same. Spongosposa, Scab, Black Leg, and Leaf Curl are others.

The danger of these diseases is not limited to a single season, as soils once infected remain unfit for potato culture for many years.

Summary.

(1) — Foreign-grown potatoes should under no circumstances be used for seed potatoes.

(2) — Such potatoes are not adapted to our soils and climate and will not return profitable yields.

(3) — Several serious diseases not now prevalent in this country almost certain to be introduced if such stock is used for seed.

Very respectfully,
L. H. Healey, Secretary
State Board of Agriculture.

Capitol, Hartford, April 9, 1912.

Many letters were received thanking the Board for their timely warning. This same warning is applicable to the coming spring of 1913.

CORN-TESTING CLUB.

With the assistance of Prof. L. A. Clinton of the Connecticut Agricultural College, the Board, so far as we know, organized the first corn-testing club in New England. Samples of seed corn were collected from thirty of the farmers in the vicinity of Woodstock, and forwarded to Professor Clinton at the agricultural college, where they were tested, under his direction, fro seed germination. After this had been done the corn was returned to the hall at North Woodstock, an institute held, when Professor Clinton gave a talk on corn growing. The test and lecture was an eye-opener to some of those present, as it was shown that the best looking ear was not necessarily the one that made the highest per cent of germination. One of the parties whose corn made a poor test persisted in still using it for seed. We doubt if he does it again however, or his neighbors, as he had a poor stand of corn.

BOYS' CORN CLUB.

In this connection the Boys' Corn Club contest of the previous year was continued. In connection with the cash prizes offered by the Board there were other prizes offered by various agricultural societies and individuals. Some seventy boys made entries, but many fell by the wayside. Among those who stayed in until the contest was ended the following were successful in obtaining the following prizes:

Ewart G. Healey of North Woodstock won first, cash $14.42, in the State Board of Agriculture contest, his score being: yield per acre, 28; exhibit of ten ears, 17½; history of crop, 20; profit per acre, 30; total, 95½. The same boy also won the $50 cash prize offered by the Connecticut Fair Association; the first prize of $15 offered by the Lowell Fertilizer Co. of Boston; the $5 in gold prize offered by Ross Brothers Co.; and the $50 trip to Washington offered by the Windham County Fair and the Woodstock Fair.

The second prize in the State Board contest, cash $12.77, was awarded to Andrew Schwab, Yalesville. He also won the $50 trip to Washington offered by the Union League Farmers' Club of New Haven. His score was 81½.

Leslie Geer of Hadlyme won the third prize, cash $12.02, his total score being 79½. He also won the $50 trip to Washington offered by Ex-Governor Weeks.

John Toth, Wallingford, won the fourth prize, cash $12.02, his total score being 76¾. He also won the second prize of $10 offered by the Lowell Fertilizer Co. of Boston.

George W. Mellor of Wallingford won the fifth prize, cash $5, total score 65¼.

The sixth prize, cash $3, was awarded to Herbert Plumb, Stafford, his score being 60. He also won the $50 trip to Washington offered by the Stafford Springs Fair.

Harold Ramsey of East Woodstock, with a total score of 54, won the seventh prize, cash $2.

This work is to be continued for the season 1913. The Board are to offer liberal premiums, and fair associations and others have signified their intentions to continue the work, in connection with the Board.

FARMERS' INSTITUTES.

The Board have done all their institute work in connection with the Advisory Board on Farmers' Institutes, believing that only through this co-operation could we get the most good from the money apportioned to us by the State. We are gratified with the success of the plan. Everything has moved along smoothly and harmoniously. More institutes have been held and at a saving in expense. Many more people have attended these meetings and a greater interest has been shown in them than at any time during recent years. Many institutes have been held, and many requests are on file for the holding of an institute in the near future. It is our opinion that this work will be vigorously pushed in the coming year.

We believe that not only the farmers, but others, appreciate these meetings which are being held for their benefit, and that they are doing a large amount of good in bringing advanced ideas relating to agriculture and other kindred subjects to the attention of those who attend them. This report will contain a tabulated statement of all institute work done in the season 1911-1912. We respectfully call your attention to the same.

AGRICULTURAL SOCIETIES.

After a careful consideration of the conditions surrounding our various State fairs, the Board decided to hold a conference with the officials of the several fairs. Accordingly, at the June meeting, the secretary was directed to issue the following notice or invitation to the president and secretary of each fair:

STATE OF CONNECTICUT,
BOARD OF AGRICULTURE.

CAPITOL, HARTFORD, July 16, 1912.

MY DEAR SIR:—

The State Board of Agriculture believe that a conference between the Board and the officers of the several State agricultural societies or fairs would bring about more effective co-operation, and assist in strengthening the fairs in many ways at the same time.

Such a conference would make *possible* an exchange of ideas between representatives from all parts of the State that would be most helpful to all. Several problems have arisen in reference to the interpretation of the requirements for securing State aid.

That such a conference may be held, you are invited as the .... of the .... Fair to attend a meeting of the presidents and secretaries of the several fairs to be held at room 62, in the Capitol, on July 30th at 11 o'clock a. m. Your expenses will be met by the Board.

D. W. PATTEN,
J. B. PALMER,
R. E. DODGE,
LEONARD H. HEALEY, Secretary. Executive Committee.

Nearly all the fairs responded, and a most profitable meeting was held. The question of "gambling at fairs" was gone into at much length, and, as the result of this discussion, the Board passed the following vote and directed the Executive Committee to see that a copy was forwarded to the officials of each fair:

NOTICE.

Special—As a result of the conference between the presidents and secretaries of the fair associations, the State Board, as the statute gives them power, absolutely prohibit, at agricultural fairs to be held in the State of Connecticut in 1912, all games in which money is offered as prizes or where prizes which have been won are bought back for cash.

Per order of State Board,
By the Executive Committee,
D. W. PATTEN,
J. B. PALMER,
LEONARD H. HEALEY, Secretary. R. E. DODGE.

We believe that the above notice, coming as the result of the conference, had much to do with the improvement that was manifested in many of the fairs held the past fall. We believe that this coming together will result in uniformity of regulations and make for many things that will improve the exhibits and increase a true and honest rivalry among the exhibitors to raise better stock of all kinds and greater and better yields from each and every acre of cultivated crops. A committee has been appointed to organize a permanent State association, in connection with the State Board of Agriculture, so that the officers of the several fairs may come together each year for advice and counsel.

A tabulated statement regarding the several departments of our thirty-two fairs will be found in the latter part of this report.

DYNAMITE DEMONSTRATIONS.

"Farming with dynamite" is one of the new "slogans" that has much to do with making farm life pleasant and profitable. Many of our farm acres which were so stony as to render their cultivation unprofitable have been made smooth and tillable at a small cost and a light expense. Ditches have been dug, rendering swamp land available. It has also been used most successfully in digging holes for the placing of trees and in subsoiling for the mellowing of the soil. Believing that there were great possibilities in its judicious use, and to impress this upon the farming public, arrangements were made, in connection with the DuPont people, to hold dynamite demonstrations. These were arranged, one for each county in the State. The names of the places and the dates which they were held are as follows:

On the land of A. W. Stanley, president of the Stanley Rule & Level Company, New Britain, Conn., April 11th, 12th, 13th, and 15th. Ditching, stump-blasting, and subsoiling, the latter consisting of six acres.

On the land of Edwin C. Johnson, State Representative, Uncasville, Conn., April 17th and 18th at 1 p. m. Subsoiling, tree-planting, and bowlder-blasting.

On the grounds of the Connecticut Agricultural College, Storrs, Conn., April 20th at 10 a. m. Subsoiling, tree-planting, ditching, stump- and bowlder-blasting.

Echo Farm, the home of the secretary, North Woodstock, April 22d and 23d. Subject, tree-planting, ditching, stump- and bowlder-blasting.

On the land of G. B. Alderman, Suffield, Conn., April 25th at 10 a. m. Subject, subsoiling.

On the land of W. H. Lee, Orange, Conn., September 10th.

A great deal of interest in these meetings was manifested, and many persons came a distance of forty miles to attend them More than 1,300 people attended the series of eight meetings. No series of field meetings has ever been arranged that has attracted as large an attendance. The Board have under consideration a plan for a like series, in different localities, the coming spring.

SPRAY CALENDAR.

Such a great interest is now manifested in the growing of orchards and raising of fruit, and because we have received numerous inquiries asking for bulletins on this subject, and especially spraying, we have added to this report what we have termed a "spray calendar." It was prepared, by request of the Board, by Prof. G. P. Clinton, botanist, and W. E. Britton, entomologist, of New Haven Experiment Station staff, to whom we wish to give all credit for its preparation. We trust that it will supply a needed want, and that it can be easily and readily understood. It appears elsewhere in this report, a copy of which can be obtained by addressing the secretary, or a copy of the calendar alone, as may be desired.

CONCLUSION.

We have endeavored in as short and concise a way as possible to call your attention to some of the many lines of assistance we have fathered. We believe that at no time, in recent years, have the agricultural college, the two experiment stations, and the several State agricultural associations, together with the State Board of Agriculture, worked as harmoniously as during the year that has just passed, this for the assistance of the farmers to adopt the best methods of advanced agriculture. The secretary especially wishes to record his appreciation of the "right-good" feeling which has been accorded him by all those with whom he has been brought in contact in the performance of his various duties.

The work of the secretary, as by statute required, is of such a nature that the greater part of his time must be spent away from his office at the Capitol. We doubt if the sentiment among the farmers through the State is in favor of a department of agriculture with a single commissioner. The strength that is obtainable through the interest of those comprising the membership lists of the several State associations is a power which we must all recognize. The Governor, in his inaugural message, set the "ball a-rolling," and we personally believe that at some time this recommendation may become a law. Until this comes to pass, however, we believe that a room in the Capitol should be the "headquarters" of all the agricultural associations, the secretary of the different associations spending therein one day in each week, thus having the office open continuously. A stenographer should also be in attendance to assist the secretaries in their labors and research. Valuable data could thus be compiled and many lines of interest to agriculture not now attempted could be done. We hope the time will soon come when this may be possible.

Tabulated Statement of Institute Work Done

in the State of Connecticut by the Advisory Board on Farmers' Institutes from January 1 to July 1, 1912.

INSTITUTE HELD AT	SPEAKERS	EXPENSES AND SALARIES	TOTAL COST	NUMB'R PRESENT
Guilford, Feb. 1.	F. E. Duffy	$ 6.50		
	Geo. V. Smith	9.40		
	A. G. Gully	3.35		
	Dr. E. H. Jenkins			
	R. R. Evans	7.50 printing		
	L. H. Healey, secretary		$26.75	150
Southington, Feb. 2.	A. G. Gully	3.35		
	F. E. Duffy	6.50		
	W. H. Card	6.00		
	R. R. Evans	5.75 printing		
	L. H. Healey, secretary		21.60	160
Colchester, Feb. 13.	E. B. Fitts	3.49		
	Arthur G. Rolf	2.15		
	J. W. Pincus			
	H. C. C. Miles, secretary	3.93		
	R. R. Evans	3.50 printing	13.07	80
Woodstock, Feb. 13.	J. H. Putnam	12.03		
	Miss M. E. Hayes	1.64		
	Prof. L. A. Clinton	4.65		
	James B. Palmer			
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		22.82	200
Eastford, Feb. 14.	J. H. Putnam	12.02		
	Prof. L. A. Clinton	7.00		
	E. E. Brown	5.00		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		28.52	90
Litchfield, Feb. 22.	H. L. Garrigus	3.57		
	Miss Corene Hall	8.00		
	F. E. Duffy	3.50		
	R. R. Evans	4.50 printing		
	B. C. Patterson, secretary		19.57	150
Northfield, Feb. 22.	H. L. Garrigus	3.58		
	F. E. Duffy	3.50		
	R. R. Evans	4.50 printing		
	No secretary present.		11.58	85
No. Cornwall Feb. 23.	F. H. Stadtmueller	12.24		
	Geo. A. Drew	9.35		
	H. C. C. Miles, secretary	4.30		
	R. R. Evans	4.50 printing	30.39	100
Union, Feb. 23.	Geo. V. Smith	10.00		
	Stancliffe Hale	9.60		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		24.10	85
Haddam N'k, Feb. 27.	Dr. E. H. Jenkins			
	S. P. Hollister	1.43		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		5.93	70
E. Haddam, Feb. 27.	J. J. Cruttenden	6.00		
	S. P. Hollister	1.42		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		11.92	110

(CONTINUED ON PAGE 21.)

TABULATED STATEMENT OF INSTITUTE WORK DONE.—*Continued.*

INSTITUTE HELD AT	SPEAKERS	EXPENSES AND SALARIES	TOTAL COST	Numb'r Present
No. Canton, March 5.	Geo. A. Cosgrove	$10.03		
	Chas. L. Gold	12.22		
	F. H. Stadtmueller	6.84		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		$33.59	225
Cheshire, March 6.	Chas. L. Gold	12.22		
	J. H. Trueman	5.61		
	Geo. A. Cosgrove	10.00		
	R. R. Evans	7.00 printing		
	H. C. C. Miles, secretary		34.83	300
Bloomfield, March 12.	J. H. Putnam	6.50		
	Miss M. E. Hayes	2.78		
	J. Norris Barnes	6.10		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		19.88	70
Colebrook, March 13.	Chas. L. Gold	6.72		
	Geo. V. Smith	9.60		
	R. R. Evans	4.50 printing		
	Geo. V. Smith, secretary		20.82	80
Torringford, March 14.	Chas. L. Gold	3.73		
	Geo. V. Smith, secretary	9.60		
	R. R. Evans	4.50 printing		
	No secretary present		17.83	112
Plainfield, March 14.	Stancliffe Hale	8.30		
	Dr. E. H. Jenkins	4.50		
	Prof. J. R. Trueman	2.46		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		19.76	85
Putnam, March 15.	Dr. E. H. Jenkins	4.50		
	E. B. Fitts	2.60		hard
	W. O. Rogers	6.50		storm
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		18.10	40
Canaan, March 21.	S. N. Spring	3.60		
	Prof. C. D. Jarvis	3.00		
	Geo. V. Smith	7.90		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		19.00	80
So. Canaan, March 21.	Geo. V. Smith	2.90		hard
	Prof. C. D. Jarvis	3.00		storm,
	R. R. Evans	4.50 printing		no
	L. H. Healey, secretary		10.40	meeti'g
Salisbury, March 22.	Prof. C. D. Jarvis	3.00		
	Geo. V. Smith	7.90		
	S. N. Spring	3.59		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		18.99	200
Pachaug, March 28.	E. E. Brown	6.40		
	J. H. Putnam	9.57		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		20.47	90
Ellington, March 29.	J. H. Putnam.	9.57		
	E. Rogers	6.20		
	R. R. Evans	4.50 printing		
	L. H. Healey, secretary		20.27	125

STATEMENT OF INSTITUTE WORK. — *Continued.*

Total number of institutes	23	
Total addresses	66	
Expenses of secretary, travel, postage, etc.		$ 94.26
Expenses of treasurer, travel, postage, etc.		12.13
Printing circulars and announcements of institute work,		41.75
Total cost of institute work done for the season		619.15

RECAPITULATION.

Number of institutes held, 23.	Total cost,	$619.15
Average cost per institute		26.92
Total attendance		2,687
Average attendance		116

Respectfully submitted,

CHAS. L. BEACH, President,
LEONARD H. HEALEY, Secretary,
H. C. C. MILES, Treasurer.

SPRAY CALENDAR FOR CONNECTICUT

BY

G. P. CLINTON, *Botanist.*   W. E. BRITTON, *Entomologist.*

For lack of space we can give only brief directions for the treatment of the worst fungous and insect pests of the plants commonly grown in the State. Frequently the average injury from pests or the benefits from the application are not great enough to warrant treatment. The troubles vary with the season, the character of which we cannot predict, and the grower must decide from his local conditions whether or not he will try to control these enemies of his crops. With some of these troubles, especially fungi, prevention rather than cure is desired. Below are common fungicides and insecticides recommended for use in Connecticut, followed by directions for using them on the different host of plants:

FUNGICIDES.

Commercial Lime-Sulphur.

Select a good brand of standard strength, guaranteed free from alkalies.

1¼ or 1½ gals.	lime-sulphur
50 gals.	water

For use on foliage. Lead arsenate may be added as a poison.

Self-boiled Lime-Sulphur.

8 lbs.	fresh lime
8 lbs.	fine sulphur
50 gals.	water

Start the lime slaking, sift and stir in the sulphur, with only enough water to cover, and boil from heat of lime for 15 minutes. Then dilute, strain

INSECTICIDES.

Commercial Lime-Sulphur.

1 gal.	lime-sulphur
9 gals.	water

Spray on dormant trees to kill *San Jose Scale, Pear Psylla,* etc.

Lead Arsenate.

3 to 5 lbs. (half as much if powdered)	paste lead arsenate
50 gals.	water

Two lbs. powdered may be mixed with 50 lbs. land plaster and dusted on moist foliage.

For all leaf-eating insects.

and apply. More satisfactory if made in large quantities. Add lead arsenate for a poison.

Bordeaux Mixture.

(STRONG)

4 lbs.	copper sulphate
4 lbs.	fresh lime
50 gals.	water

(WEAK)

1 lb.	copper sulphate
4 lbs.	fresh lime
50 gals.	water

Dissolve the copper sulphate in hot water or in a coarse bag suspended in cold water. Slake the lime separately. Dilute each to about 20 gals. Strain the lime into the spray barrel, then add the copper and fill the barrel with water. Stock solutions of each (1 lb. to 1 gal.) may be kept indefinitely. Add lead arsenate for a poison. For use on foliage.

Ammoniacal Solution Copper Carbonate.

6 ozs.	copper carbonate
3 pints	strong ammonia
50 gals.	water

Use just enough ammonia (diluted several times) to dissolve the copper carbonate, then dilute to proper quantity.

For use on foliage where no sediment is desired; otherwise Bordeaux is preferable.

Paris Green.

½ lb.	Paris Green
1½ lbs.	fresh lime
50 gals.	water

The dry poison may be mixed with 50 lbs. land plaster and dusted on moist foliage. For all leaf-eating insects.

Hellebore.

1 oz.	fresh hellebore
1 gal.	water

May also be dusted on moist foliage. For *Currant Worms,* and other *Sawfly* larvæ.

Kerosene Emulsion.

2 gals.	kerosene
½ lb.	common soap
1 gal.	water

Dissolve the soap in hot water, add the kerosene and churn together until a white creamy mass is formed, which thickens on cooling. Dilute nine times before using.

For use on foliage to kill *Aphids.*

Miscible Oils.

4 gals.	miscible oil
50 gals.	water

For use on dormant trees to kill San Jose Scale.

Common Soap.

1 lb.	laundry soap
8 gals.	water

FUNGICIDES.

Formalin.

1 pint (1 lb.)	formalin (formaldehyde)
30 gals.	water

For seed potatoes. Soak for 1½ (one and one-half) hours.

For soil treatment, 1 pint to 12½ gals. water, using ⅜ to 1 gal. to each square foot of soil. Cover for 24 hours, stir soil, and air for 3 or 4 days before seeding, or at least 10 days before setting plants. Manure, if used, should be applied before treatment.

INSECTICIDES.

Cut soap in thin slices, dissolve in hot water, then add cold water to make right quantity. For use on foliage to kill *Aphids, Red Spider, Thrips,* etc.

Poisoned Bran Mash.

1 quart	wheat bran
1 teaspoonful	white arsenic
1 teaspoonful	cane molasses

Add water and mix to form a stiff mash and distribute over the field a few days before setting plants. For poison, lead arsenate or Paris green may also be used.

To kill *Cutworms.*

APPLE.

General Treatment. Three applications are advised in most cases: (1) on unfolding leaves just before blossoms open; (2) just after petals drop: (3) Three or four weeks after second. If fungi are bad, use strong Bordeaux for 1st and weak Bordeaux with lead arsenate for 2nd and 3rd; if not bad, commercial lime-sulphur with lead arsenate may be used for all treatments on Baldwin and Greening. In many cases the 1st may be omitted. Usually these sprayings will prevent injury from the common fungi and leaf-eating insects. For *Rust,* thoroughly coat the leaves in May while *cedar apples* are ripening. For *San Jose Scale,* spray with strong lime-sulphur or miscible oil just before leaves appear. For *Aphis,* spray under side of leaves with kerosene emulsion. Examine in May and September and dig out *borers.*

ASPARAGUS.

Rust can hardly be controlled by spraying, even with resin-Bordeaux, and it is seldom practiced. Burning after the plants die may help destroy the spores, though of questionable value. Some varieties, like Palmetto, partially resist the disease, and attempts are now being made to breed resistant strains. Cut below ground all shoots as long as the cutting season lasts, to prevent rust developing first stage, and *Beetles* from laying eggs. Later spray with lead arsenate to control beetles.

BEAN.

Anthracnose, the most injurious fungus attacking string beans, carries over in the seed. Good seed free from disease should be chosen. Spraying is not practiced here; to be effective, Bordeaux must be used early when plants are two inches high, and repeated at least twice at intervals of about ten days.

Downy Mildew attacks Lima beans, causing injury after July 15th, in very wet seasons. Keep the vines coated with Bordeaux after July 15th.

BLACKBERRY. RASPBERRY.

Crown Gall infested plants should be destroyed. Do not propagate from diseased plantations or set blackberries, raspberries, grapes, peaches, or plums on land previously infested. *Orange Rust* is perennial in these plants, which should be dug out and burned as soon as detected. Spraying is of little value.

CABBAGE. CAULIFLOWER.

Black Rot, caused by bacteria, occasionally proves serious in this State. It is readily established in the soil and may become worse each year unless crop rotation is practiced. Obtain seed from healthy crops or treat it with formalin (No. 1) for fifteen minutes to kill germs. Burn all refuse from diseased plants, and plant those varieties like Savoy, Flat Dutch, and Copenhagen Market, which are less affected. *Club Root* may be controlled by liming the soil (80 bushels per acre broadcast) and by sanitary practices. For *Maggot,* place hexagonal disks of tar paper about stems of plants when setting and destroy early all stumps of harvested plants. For *Cabbage Worm,* spray carefully with lead arsenate. For *Aphis,* spray with kerosene emulsion.

CELERY.

Leaf Blight (Rust) and Leaf Spot. Cover seed bed plants with Bordeaux and repeat treatment in field, using ammoniacal solution copper carbonate late in season to avoid sediment on stems. *Leaf Spot* increases after banking or in storage, when the plants should be dusted with sulphur, a treatment often helpful in the field. *Celery Caterpillar* is best controlled by handpicking.

CHERRY. PLUM.

Anthracnose injures the leaves, causing them to drop. *Brown Rot* causes the fruit to rot at harvest time. Early spraying of the leaves with self-boiled lime-sulphur is advised for the former. For the latter keep the fruit coated after it is half grown. Two to four sprayings are necessary, according to season and variety. With plums, thin the fruit so that it does not touch, and destroy all mummies. *Black Knot* may be controlled by cutting off during winter all infected branches several inches below knots, and burning them. Spraying early in May, June and July with self-boiled lime-sulphur or atomic sulphur (10 to 50) helps to prevent reinfection and spore formation on remaining knots, and is useful in controlling *Anthracnose* and *Brown Rot.* For *San Jose Scale,* spray dormant trees with lime-sulphur. For *Curculio,* jar the trees each morning for six weeks after blooming, catch the beetles on sheets and destroy them.

CORN.

Smut. Fresh manure on the land furnishes a place for spore germination and the formation of aerial spores which are blown to the young tissues, especially infecting those mutilated in suckering or detasseling. Remove and burn the smut balls. *White Grubs* often injure corn by eating the roots. Corn should not be planted on sod ground. Crop rotation, late fall plowing, and thorough pulverizing with a disk harrow are recommended. For *Cutworms,* see tobacco.

CUCUMBER. MUSKMELON.

Leaf Blight and Downy Mildew may be controlled in normal seasons by spraying with Bordeaux, from July 15 until the end of the season, requiring four or five treatments ten to fourteen days apart. In very wet seasons it is a question if spraying for melons pays. For *Striped Beetle,* spray or dust the young plants with lead arsenate. For *Aphis,* underspray the leaves with kerosene emulsion; place tobacco stems around plants,

CURRANT. GOOSEBERRY.

For *Anthracnose*, etc., spray unfolding leaves with Bordeaux, repeating two or three times, 10 to 14 days apart. Spray once after fruiting in bad seasons. Avoid European varieties of gooseberry, which are subject to *mildew*. *Currant Worm* may be controlled by spraying or dusting with hellebore or lead arsenate. Spray dormant bushes with lime-sulphur to kill *San Jose Scale*.

GRAPES.

Black Rot is serious on some varieties and often requires more than one season to get it under control. Spray with Bordeaux as soon as the second or third leaf appears, again just after blossoming, and repeat two or three times 10 to 14 days apart, preferably just before a rain. Destroy all mummies in autumn. For *Leaf Hopper*, spray under surface of foliage with kerosene emulsion. For *Berry Worm*, bag the clusters soon after the fruit sets.

ONION.

Smut remains in the soil at least 13 years, so infested fields should be avoided. A mixture of sulphur 100 lbs., and air-slaked lime (50 lbs. per acre) applied in drills is useful; also formalin (1 to 100) applied by the drip attachment, wetting the seed as dropped, using about a gallon to each 400 feet. *Stem Rot* develops at harvest time, and onions should be dryed quickly and not moistened unnecessarily. Treat them in crates in a tight room or tent with formalin fumes liberated by potassium permanganate, (23 ozs. to 3 pints formalin per 1,000 cubic feet of space). Place the potassium permanganate in one or more shallow dishes, add the formalin, leave quickly and close the room tight. For *Maggot*, practice crop rotation. For *Thrips* or "*White Blast*," spray early and often with soap and water or kerosene emulsion.

PEA.

Aphis may be controlled by early planting of early varieties, spraying vines with soap and water or kerosene emulsion, and brushing vines just before cultivating.

PEACH.

Rot and Scab. Spray first about May 15th with self-boiled lime-sulphur, repeat three or four weeks later, and give third treatment between July 5 and 15. Commercial lime-sulphur often injures foliage, and should never be used stronger than 1 to 150. For *Peach Sawfly,* lead arsenate, (1 lb. to 50 gals.) may be used alone or with self-boiled, but not with commercial lime-sulphur. For *San Jose Scale* and *Leaf Curl,* spray with strong lime-sulphur in April just before leaves appear. For *Curculio,* see plum. Examine in May and September and dig out *Borers.*

PEAR.

Fire Blight is a bacterial disease, treated only by pruning well below the affected tissues. Disinfect tools after each operation by wiping with sponge or rag moistened with corrosive sublimate solution (1 to 1,000). Dress large wounds with white lead or coal tar paint. For *Scab,* spray with Bordeaux as for apple. Treatment unnecessary except on certain varieties. For *Psylla* and *San Jose Scale,* spray with strong lime-sulphur just before leaves start in spring.

POTATO.

Beetles and Blight. Spray or dust with lead arsenate as soon as larvæ appear. Paris green may be used, but will not stick as well and is more liable to injure foliage. For *blight,* keep vines coated after middle of July, with strong Bordeaux, to which lead arsenate may be added to kill *beetles.* From two to five Bordeaux sprayings are usually necessary, depending on the weather and manner of spraying. Hand-spraying is more thorough and effective than machine work. Deep planting and ridging protect tubers from rot. For *Scab,* plant on new ground, but avoid lime, wood ashes, or stable manure, especially hog manure. Plant only smooth seed, but if at all scabby soak in formalin, q. v., or treat with fumes (see stem rot of onions.)

PUMPKIN. SQUASH.

For *Borers,* slit stem lengthwise and kill larvæ; cover stems with earth two to three feet from base and they will make new roots. For *Squash Bug,* destroy egg clusters by hand; spray with kerosene emulsion to kill young bugs.

QUINCE.

Fire Blight. See pear. For *Leaf blight,* spray unfolding leaves with Bordeaux and repeat as soon as blossoms fall and again about three weeks later. Add lead arsenate for leaf-eating insects. For *Borers,* see apple. For *Curculio,* treat as for plum.

TOBACCO.

Calico is communicated to healthy plants from diseased ones through touch. Make seed beds on land not in tobacco recently, and do not use tobacco water or stems on them. Pull out all diseased or suspicious plants and cleanse hands with soap and water before touching other plants. Use great care in transplanting. Remove all plants left over in seed bed. For *Root Rot,* soak seed bed with formalin (No. 2) or sterilize with steam. For *Cutworms,* distribute poisoned bran mash about the field a few days before setting plants. For *Flea Beetles* and *Hornworms,* apply lead arsenate.

TOMATO.

Leaf Spot. Keep plants covered with Bordeaux in seed bed and after transplanting. Add lead arsenate if flea beetles or hornworms are abundant.

ANNUAL
MIDSUMMER MEETING.

The Board held a successful field meeting on August 20th at Vine Hill Farm, Elmwood, at the invitation of Mr. C. E. Beach, seconded and assisted by Mr. F. H. Stadtmueller. These two gentlemen did all possible to make the meeting pleasant and profitable. The barns and dairy rooms were inspected. Mr. Beach extended the glad hand of welcome and W. H. Lee, vice-president of the Board, responded.

The speakers of the day were Hon. E. D. Howe, one of Massachusett's prominent dairymen, and George Warren Davis, president of the Connecticut State Dairymen's Association. Mr. Howe is a most interesting speaker and his address did those in attendance much good. Mr. Davis is always listened to with much interest by his brother dairymen.

The meeting would not have been complete without the words of greeting and encouragement which were added by Mr. Stadtmueller. Vine Hill Farm is one among the fine dairy properties in our State. Had it not been for the inclemency of the weather in the morning, five hundred people would have been in attendance; as it was, there were some better than one hundred and seventy-five.

ANNUAL MIDWINTER MEETING AT NEW HAVEN.

PROGRAM.

Tuesday, December 17.

10.30 A. M. Music.

10.45 A. M. Formal Opening. *By Vice-President Wilson H. Lee.*

11.00 A. M. Invocation. *By Rev. Watson L. Phillips, D. D.*

Address. *By His Honor Frank J. Rice,*
Mayor of New Haven.

Response. *By His Excellency Simeon E. Baldwin,*
Governor of Connecticut.

11.30 A. M. Address—"What Our National Government Will Do to Assist the Farmers of Connecticut."
By D. A. Brodie,
Assistant Secretary of Agriculture,
Washington, D. C.

Intermission.

1.45 P. M. Meeting Called to Order.
Address — "Selecting and Breeding of Dairy Cattle."
By H. O. Daniels, Middletown.

2.30 P. M. Address — "Down-to-date Market Gardening."
By C. C. Hulsart, Elmwood Farm, New Jersey.
[Also connected with the State Bureau of Plant Industry.]

7.30 P. M. Address — "The Rural Progress That's Real."
By Hon. Charles M. Gardner, Westfield, Mass.

Wednesday, December 18.

9.30 A. M. Music.

9.45 A. M. Meeting Called to Order.
By Vice-President Wilson H. Lee.

Business Meeting of the State Sheep Breeders' Association. *A. B. Cook, President,* Farmington.

10.15 A. M. Address — "Breeding of Horses and Soil Fertility."
By F. C. Minkler, New Brunswick, N. J.

11.00 A. M. Address — "Sheep Husbandry in New England."
By Hon. Frank Gerrett, Greenfield, Mass.

11.45 A. M. Short Talk "Why This Corn Received the Prize."
By Professor Bower,
Connecticut Agricultural College.

1.30 P. M. Address — "Business End of the Poultry Industry."
By Prof. John F. Graham,
Amherst Agricultural College,
Amherst, Mass.

PROCEEDINGS.

REPORT OF THE PROCEEDINGS OF THE ANNUAL MIDWINTER MEETING OF THE STATE BOARD OF AGRICULTURE

1912

The annual midwinter meeting of the State Board of Agriculture was called to order at Harmonie Hall, New Haven, Connecticut, on Tuesday, December 17th, 1912, Vice-President Wilson H. Lee in the chair.

THE CHAIRMAN: Now, if you will come to order, I will call upon the Rev. Dr. Phillips to invoke the Divine blessing.

DR. PHILIPS: Let us pray. Almighty God, our Father, we humbly acknowledge our dependence upon Thee and our obligation to give Thee thanks for all of the manifold mercies of life which Thou has bestowed upon us. Thou art the God of nature, of sunshine and of storm. Thou givest the early and latter rain; seed time and the harvest. Thou has abundantly watered the earth and settled the riches thereof, so that it bringeth forth the seed for the sower and bread for the eater. Thou art worthy to receive the best praise we can offer, and here today we bow ourselves reverently before Thee, and we offer Thee our thanks for all Thou hast done. We thank Thee for this fertile land which Thou didst give our fathers, with all its diversity of soil and climate, with its rich deposits of mineral wealth, with all its promises fulfilled in the years of the past. We thank Thee for the institutions our fathers established, for the men who have ruled over us, for the spirit of our people, and the record they have made; and we ask that we, the successors of those men who trusted Thee and endeavored to do Thy will, we, the inheritors of that which they began to nourish, may have strength and grace, courage and faith, to carry on the work according to the need of our time. We ask Thy blessing upon us. Bless the President of the United States, and all who share with him in the responsibility of government. Bless our commonwealth, our Governor, and all our officers. Bless the city, and Thy servant who is appointed to rule over us as the Mayor, and all those who assist him in solving the problems of our city life. Give Thy blessing to this institution which has called us together today. Grant that these men and women shall stand as a varied bulwark for our social establishment, and that they realize the responsibility, honor, and opportunity that comes to them as those who use the soil and force of nature for the sustenance of the people. Grant we beseech Thee that in all deliberations of this convention, as in all of the affairs of daily life, they may seek divine guidance, and may find the light of Thy favor, and walk bravely forth in the path which Thou hast assigned to them and marked out before them, and we will render praise unto Him who has taught us to pray.

Our Father, Who art in Heaven, hallowed be Thy name. Thy Kingdom come. Thy will be done on Earth as it is done in Heaven. Give us this day our daily bread, and forgive us our trespasses as we forgive those who trespass against us, and lead us not into temptation but deliver us from evil, for Thine is the Kingdom, the Power and the Glory, for ever and ever. AMEN.

THE CHAIRMAN: Three years ago this Board held its annual meeting in this city. Since that time, you who have come from a distance, and have not visited the city before, have noted many improvements. No small factor in the making of these improvements has been the Mayor whom we elected since that time when you were here before. Three years ago he was practically an unknown quantity in the public affairs of our city. Today he stands out as one of the best Mayors that New Haven ever had. He is not only interested in public and civic affairs, but he owns and runs a farm. There is where he gets health and recreation, and the strength to carry on the many duties of his office. There is where he obtains rest from the many cares of the responsible position which he occupies.

I take great pleasure in introducing the Mayor of our city, Honorable Frank J. Rice.

MR RICE: Mr. President, your Excellency, and Members of the Board of Agriculture of the State of Connecticut: It is with great pleasure that I come here this morning to extend to you on behalf of our city a most cordial welcome. Your president has told you that I am interested in farming. That is true. I do most sincerely respect the farmer and hold him in high esteem. I am greatly interested in this great industry. It is an industry that has been greatly neglected in New England. Your president told you that I am somewhat of a farmer. I have a little place up here in the little town of Monroe where I have got into the habit of spending my vacations. We spend a part of the months of July and August up there, and I want to say to you men that those are the two best months in the year for me. I get more pleasure up there in that little place, on that little five acres of ground, than in anything else that I have during the year. It beats going to a banquet night after night all to pieces. Of course I have only about five acres, so there is not a great deal to take care of, but I generally manage to have a good little garden. It is not a full-fledged dairy farm like the one that my friend Lee runs over there in the town of Orange, but it is a little patch in which I very much delight to get out and work around when we are staying over there. Mrs. Rice and the boys certainly enjoy our life there.

I think you men are to be congratulated upon the choice of the occupation which you have made. I think that one of the great mistakes that our country boys continuously make is in leaving the farms and going off to the cities. I believe there is a great opportunity for wide-awake men on the farm today. With all of our new facilities, and with new methods that have come in of doing business, I believe there is certainly great opportunity for any wide-awake young man in farming, and it is with deep regret that I have traveled over these beautiful hills and looked at the fertile land that our forefathers tilled and I have noted so much of it that might be under a much better state of cultivation. Our forefathers did not belong to the union and work eight hours a day; they probably worked from four in the morning until eight in the evening nearly every day. You go out into the country and see the immense stonewalls that they laid up there. Many of those walls were put in place years and years ago, and are as solid and substantial today almost as when they were first erected. I have had my little place up in Monroe for about seven years and I have had a little opportunity to watch the process which has been going on in our farm communities. Many of the premises that were there when I first went there are today vacant. Some of those places are today well grown up to bushes, and it seems almost a shame that they should be so. I believe that the time is coming, if it has not already come, when the old farms of Connecticut are going to be taken up and agriculture is going to come into its own again. In fact there are many indications that that time has already come. I am glad it is so. These farms are going to be more productive than ever, because the men who are going to run them today are going to have the advantage of up-to-date machinery and methods of which our fathers and those who lived on these places a short time ago knew nothing. Farming is going to become one of the great industries of the country.

When I was a boy I was brought up on a farm, and I sometimes regret that I ever left it. I hope the day will come when I can go back to the old farm and stay there. It beats politics all to pieces, so I want to say to you this morning that it is with the greatest pleasure that I welcome you to New Haven today. I hope that this convention will prove to be one of the best you ever held and that your deliberations may be of great benefit to each one of you.

I thank you, Mr. President, for honoring me in giving me the opportunity of just coming here today and saying these few words in my feeble and humble way. I am deeply and sincerely interested in your work and I hope that this convention will be the best that you have ever held. (Applause.)

THE CHAIRMAN: We can say of the Mayor that we hope that some day he may be a farmer. (Laughter.) I said to the next gentleman whom I will introduce to you this morning, that if he ever got through being Governor long enough we would make a farmer of him. He started in a little late in life, but, from the interest he has taken in agriculture, and the promptness with which he has attended all our meetings, I am sure that he is more interested in agriculture than in any other interest of the State with which he has had to deal. We are all very proud of him, a New Haven man, and proud of the dignity with which he has carried on the office of Governor of our State. You will recall that last year he was a national figure, but Connecticut was too small a State to select a Vice-President from; but fortunately for us, because it has given us a good Governor for another term.

I take great pleasure in introducing to you now Governor Simeon E. Baldwin.

GOV. SIMEON E. BALDWIN: Mr. President, Ladies and Gentlemen: Mr. Rice has welcomed us to New Haven, and told us about his "Rice" farm up in Monroe. (Laughter.) I knew we had all sorts of farms in Connecticut, but I never knew we had a "Rice" farm before. They say that out on the southern shore of our harbor, on Long Island Sound, they raise persimmon trees. That may go with the "Rice" farm, and it goes to show that Connecticut is not very far from South America after all.

Well, we are proud of our Mayor here in New Haven and there are many other things that we are proud of. We are proud of our buildings, proud of our new courthouse, and our big new hotel. Whenever a gathering like this comes to New Haven we are sure of some pretty good things in the way of transportation facilities, — plenty of room to gather in. We now have a very good hotel. New Haven has done one unique thing during the last two years. They made out to get a Governor and a Lieutenant-Governor both from the same city, Lieutenant-Governor Blakeslee and myself. It was the first time in the history of the State that a Governor and a Lieutenant-Governor came from the same town. During the next term she has made some provision for herself. She could not quite have the audacity to require again that both the Governor and the Lieutenant-Governor should come from within her limits, but she took good care that the candidates for Governor and Lieutenant-Governor should be New Haven men; so she had a pretty good chance of electing one or the other. (Laughter.)

But, gentlemen, we have come together today to talk about a real live subject,— agriculture in Connecticut. It is our first interest. Connecticut originally, you know, was mainly an agricultural State, though partly a commercial State. Now anybody would have to say that manufacturing is our principal interest, but agriculture is still second in productive power, and I am not sure but agriculture is still first in the hearts of the people of the State. One thing is certain. The State does far more for agriculture than for manufacturing as a State. Our State treasurer is at the command of agriculture far more than at the command of the manufacturing interests. Our few training schools and the few courses in the mechanic arts which we have make little showing when compared with the Connecticut Agricultural Experiment Station at Storrs, and at New Haven. The Connecticut State Board of Agriculture has been a sort of agricultural commission. The State Geological and Natural History Survey and all of the various associations have contributed in various ways to advance our farming interests. The State is pretty generous to the farmer. The United States has also been very generous to the farmer. I sometimes think that the United States has been almost too generous to our farmers in the length of the bulletins which they submit for the inspection of our agricultural population. Some of the bulletins and books issued by the Department of Agriculture seem to me too lengthy to be read. I believe in putting things in good plain English so that our farmers will read said agricultural reports. It is better to have those things stated in a few plain words which can be understood and appreciated than to have them too lengthy or too technical. It is better to pay more attention to the stating of results in such a way that they can be understood than by stating the detailed process which may lead to the results. Science, common sense, and general experience usually come out finally by the same point. Our farmers knew the benefit which comes from the application of the principle of the rotation of crops and of allowing the land to lie fallow a part of the time long before our scientists were aware of the reason for it. I was talking the other day when in Washington to our Secretary of Agriculture in regard to the great achievements in agriculture during the comparatively brief period since he has been first head of that department. Mr. Wilson has now been Secretary of Agriculture for something like sixteen years, and it was during that period he said the American farmer first became really acquainted with the theory of drawing nitrogen out of the air into the ground, and familiar with what judicious planting could do with the help of bacteria in fertilizing the soil. When I was a farmer's boy, for I was on a farm as a boy for three years, the view which was then held was that the soil had just about so much good in it you might as well abandon your farm unless you shoveled in something more; that you could not continue to take out of the soil without putting something in. The other day I met Governor Mann of Virginia, — met him when I was in Richmond. He said that they had some land in Virginia that was so poor that you could not raise an umbrella on it.

The modern view is that you have got to cultivate your farm, and know enough to harness bacteria as well as horses in the service, and cultivate roots that will bring nitrogen into your service. In this way you can succeed. I have spoken of the good work the United States government has been doing in the development of agriculture. It has gone on hand in hand with many things that our State officials had been doing, and more so I believe than is generally appreciated. I wonder, for instance, how many farmers here have ever heard or read of the bulletin showing the underground waters of Connecticut. That bulletin was prepared three years ago, jointly by the United States and the State Geological and Historical Survey. If any man living in the towns which that report covers wants to dig a deep well, he can probably save money by consulting it before he puts his spade into the ground. The maps are good and the report contains some very good information. That was gotten up by the joint action of the State and the United States. But, of course, this is a subject on which you are to hear more, and from someone who can speak with more authority than I can, the efficient Secretary of Agriculture, Mr. Brodie.

If there was time I should be glad to say a few words on two matters that have interested me a good deal,—That of sheep raising and the other deer raising. I am a friend of sheep raising, and a doubter of deer raising. Connecticut is well adapted to both, but one seems to promise more than the other does. I might only add that our secretary has got a good program and one that deserves your close attention. Talks like these are worth something in these meetings of the Board in dollars and cents to every farmer who has heard them. A good talk with such a purpose is worth more, a good deal, to a man than a good book, and it is probably due to the fact that one can talk back.. Questions and answers are one of the best features of our annual meetings, and I hope they will continue to mark the character of these annual affairs.

Mr. President, and gentlemen, with these few words from me let me express the hope that this midwinter meeting of the Board may be one of the best that we have ever had. (Applause.)

THE CHAIRMAN: I am sure we have been very much interested in the talk of the Mayor, and also in what the Governor has said to us this morning, but I think that one of the greatest things that interests the farmer today is what the United States government is doing for agriculture. One of the latest moves of President Taft looking toward the establishment of farm credits is to my mind one of the greatest movements for the uplifting of agriculture that has yet been inaugurated. Many farmers, as we know, would like to inaugurate improvements on their farms, but there is a lack of funds. If we can start these co-operative loan associations, which have worked so successfully abroad, that difficulty in a way will be helped.

Another thing that we must look forward to is the establishing of co-operative marketing. There are many good farmers who are poor merchants. Like a great many manufacturers they find it is one thing to manufacture, and it is altogether another thing to market their products. That is just as true in farming. The farmer out West is saved that trouble to a very great degree through co-operative work, and that is what we must look to in these Eastern States, in my mind. I noticed yesterday that there was appropriated in Massachusetts to the college $266,000, and for Board work the sum of $90,000, making altogether about $350,000 appropriated annually for the benefit of agriculture in Massachusetts. I can remember very well in our own State, when I appeared before the legislative convention in the interests of agriculture, that I did not get a very warm reception and they did not seem to be very much interested in the subject. They seemed to think that manufacturing was of more importance than agriculture. It gives me a good deal of pleasure therefore to see this money appropriated to maintain the agricultural college and these different assets that are doing so much good, but I am very glad to see that within the past three or four years the sentiment among manufacturers and business interests in this State has changed very materially toward agriculture and the farmer. They see that, in order to maintain the industrial supremacy of this State, agricultural interests must be fostered and built up. I am pleased to say that within a week a movement has been started by manufacturers' associations of this State, looking toward better ways that will very materially help the farmer.

We have a man here this morning, I am pleased to say who can give us a great deal of interesting information in regard to what the United States government is doing or proposes to do to help the farmer.

I take great pleasure in introducing at this time Mr. E. A. Brodie, Assistant Secretary of Agriculture.

MR. BRODIE: Mr. Chairman, Ladies and Gentlemen: I feel compelled to make an excuse this morning for the way in which my name appears on your program. I do not wish to appear under any false colors. I see that my name appears upon the program as Assistant Secretary of Agriculture. I have hardly yet attained that honor of being Assistant Secretary of Agriculture. I happen to be one of those in the line of promotion farther down.

The plan of co-operation between the farmers and the United States Department of Agriculture and the United States government, which we are preparing to do in Connecticut, is a phase of farm management that consists of demonstrations. It is that work more particularly which the government is now aiming to do. I propose to explain that this morning. I did not understand that I was to come here to explain anything about co-operative or rural credits, because there are others who are better classified to speak about that than I am. The principal phase of the work that I wish to present to you this morning is that of farm management as shown by field studies and demonstrations. When the agricultural colleges and State experiment stations were established they were established with one idea in mind, and that was to benefit the agriculture of the country, to be of some benefit and help to the farmers. Every effort that these institutions have made towards getting closer to the farmer has been one of evolution, or rather has been a subject of evolution. Your Governor touched upon that subject very nicely this morning when he stated in his criticism of the bulletins that have come from the United States Department of Agriculture were too lengthy and technical and had some other faults. That very criticism from him and from others has been the thing that has led agricultural colleges, the stations, and the Department of Agriculture to try to simplify their work, and has led them to see the importance of making their work so simple that the farmers and everyone could understand it. The work of these institutions in the early stages was necessarily technical. The farmer did not understand why nitrogen was taken from the air to fertilize the land. It was necessary, in order to understand the fundamental principles involved; it was necessary to find out why that was done and why it acted in that way. Consequently the first workers whom we had along these matters were men who were technically trained, and whose work of necessity had to be to find out the underlying principles, or the underlying information which was necessary in order to understand the action of nitrogen. Most of these men were so technical in their make-up that they could not state a thing very well so that a practical man could understand. Only the bacteriologists, chemists, and the scientific men generally could understand their expressions. However the efforts of all of these institutions have been to make their literature plainer, and to clarify the language of these technical men. One of the first plans that these institutions inaugurated for getting their work in a better way before the farmer so that he could understand it, was through the farmers' institutes, and a great many farmers' institutes have been held. They have been conducted in almost every country part of the United States. But the great difficulty with the farmers' institutes was that, while those who were particularly interested in the development of farming attended the institutes there were a great many people who needed the information and the instruction given at such meetings who never came there. Consequently the effort that was put forth in the work has been to a very great degree lost, because the farmers or those classes of farmers who were needed the most to be reached would not go to those institutes. When I first started out in that work I well remember how many derogatory things were said about it. They called these men who were engaged as institute lecturers "book farmers," and all that sort of thing. That sentiment has not died out yet. We have such men still who will sit on the fence and whittle and make fun of those who are going inside to hear what they call "book farmers" in their talk. That sentiment is not as pronounced as it used to be.

The next process in the development of the idea was to get our work on a basis so that the farmer and everyone else could understand it, and so that we could reach a greater number; so the system of farm demonstration work was started. It was believed that if we could get a farm started in each locality which was run according to up-to-date methods it would be a great help. Of course the greater the number of such farms in a locality the greater the power of good. It was believed that that could be done, and that such farms would be a power for better agriculture, in that community. Where these farms have been started in almost every case they have been dismal failures. The farmers in the first place, it was found, would not visit them. They considered that just because the city or the county or the national government was behind them, they were run on a plan that they could not understand or comprehend. Many a farmer has been apt to think and very often has been frank to say that if he had the government back of him he could run his farm too.

Now these things, necessarily, were important stages in the development of the fact that we must make our work of a practical nature; of such a nature that the farmer would be convinced on the face of it that it was worth while. It happened by accident that a young man came to the office of a farm management where this work was being developed, and described some work that he had been doing up in Bedford, Pa. He had been sent there by his physician to recuperate. He had broken down while practicing the legal profession, had worked too hard, and been obliged to give up his work and get out into the air. He had had his constitution undermined, and had been sent out into the hills to look up health. While he was wandering around there, he got interested in what the farmers were doing. He saw the condition they were in, and he saw the situation which was created through the lack of ambition on every side. He talked with them as he went about in his walks. He asked questions about their farm affairs, about their agricultural literature, and the papers that they read, and that sort of thing. He found there were very few of them who took a farm paper, and fewer still who tried to put into practice anything they read. Many of them could not read at all. This man was a pretty broadminded kind of a lawyer, and he began to develop the idea that in some way might be of some help to those fellows. He started first to get literature from experiment stations and agricultural colleges and to distribute it among them. He got some literature and bulletins from the Department of Agriculture at Washington. He went into the store and bought seed at his own expense and distributed it to those farmers. He saw that one of the many things that those farmers lacked was good seed. They had been sowing the same seed on the same land for years and had never realized that one of the important things in good farming is to plant good seed. This young lawyer saw that one of the chief things necessary to get good results was plenty of good seed. He began to illustrate that idea and distribute the information that he got. It was about that time that he came to the Department. He was pretty nearly at the end of his own resources. We heard his story and it was decided that the Department was in a position to give him some help. In order to enable him to get along, the Department decided to pay him a salary and he devoted his entire time to the work among those farmers. The Department also paid his traveling expenses. He has been working out there now about four years, and in that time he has not only attracted the attention of every farmer in that county, but in other counties around there. He has personally gone into the homes of those farmers and held institutes. He did not call them that. He just went into a community and called a few neighbors together and talked with them about improved farming. It might be the value of good clover, or whatever subject he chose to discuss. He introduced clover into that section. Lime was another thing he found was needed there, and so he got them together and gave little talks on those subjects at the right season of the year when those things would be the most valuable. One of the most important things that he did was to get the farmers interested in a few old orchards they had there. There were some old orchards that had been planted some forty or fifty years ago and which had been badly neglected. Disease got into the trees, and the probability is that in those forty years hardly a tree had produced a barrel of marketable apples, and not a cent of revenue had been made out of them. Certain it was that there was no revenue coming from them when he took hold of them. During the winter months he got the farmers together, and he went out with them, showing them how to prune and care for those trees. He fixed them up in good shape. He went about in that way helping the farmers. Another instance, he bought at his own expense a spraying pump, set it up, and showed them how to mix sprays; and showed them how to apply the mixture. During the growing season he showed them how to thin the fruit so as to give it an opportunity for the best development. When the time came to harvest the fruit he showed them how to pick and pack the apples for market. Then he went to Philadelphia and looked up a market for this fruit. For the first time in the history of that community those farmers woke up to the fact that they were shipping marketable apples into Philadelphia, and many other points. Now the great improvement which has taken place in the farm development and in the farm industry in that county has been the result of that man's work. His work has been among a poor class of farmers, where they were ignorant, many of them too ignorant to read, but they took to this man; they liked him. His personality won out, and in this county they marketed thirty-two carloads of apples this last year. There were three grades, 1, 2, and 3, in every one of those packs, and the farmers of Bedford County have put themselves on record as saying that the credit is due to the work which this man has done. For the first time in the history of that county they began to get a profit out of their orchards, and now these farmers are very much encouraged. They are not only marketing good saleable apples, but they have introduced other features. This year over eight thousand acres of corn were raised there, together with one hundred acres of alfalfa, and soy beans have been introduced, — a crop hitherto unknown in that county,— and it has become one of the most important that they raise there. Now this man in Bedford County, appointed by the Department of Agriculture, gave us the first real idea of what might be done — what a skilled man who knew farmers could do by simply going into a neighborhood and working with them as he did in this case. It dawned on the Department for the first time that that was the kind of thing most necessary to success in order to convey agriculture to the classes of farmers that needed it most; that when the right kind of a man is found, a man who has the proper kind of training, and with the right personality, and put him into a locality and let him study the conditions and work as this man did out in Bedford County, Pennsylvania, the results are bound to be good. Let him get acquainted with every farmer, study local problems, not only as to the growing of crops, but as to the marketing of them as well. That man cannot help but succeed if he is a man of intelligence. That is what he has done, and he is recognized up in that vicinity as a real friend of the farmers. Wherever he goes he has their confidence. Now, the illustration of the good results which come from this kind of thing enables us to understand this work. The work that Ross has done in that county has been the means of starting of other work of the same kind.

We put a man into Thompkins County, New York, where an appeal had come to us to do something. There was a section of the country where the soil was giving poor results for the labor which was spent upon it. Thirty-five or forty years ago that was a good grain country, but largely through the lack of good judgment and through poor methods the land had been allowed to run down until that kind of farming was not profitable. Good crops could not be grown. Now, in this case, we put a man in there at the solicitation of the farmers themselves. The man had been raised in that section. He knew farming, and he had made a success of it himself. He was an educated man, and a man who knew how to get along with farmers. He looked over the situation, and the first thing he did was to ask that he be given a month in which to make a report. At the end of the month he asked for another. At the end of that time he made up his mind that something could be done to help those farmers, so he said he was prepared to go ahead. Now, on account of the condition of the soil in that section, when this man went out there farm land was being offered as low as $4 per acre. The farmers had got discouraged. Men were willing to take almost anything they could get for their land and get out. The average yield of Irish potatoes on that land was about forty bushels to the acre, and clover was almost unknown. Mr. Monroe went in there, and the first thing he did was to bring in a carload of lime and give it to two of those farmers there. He bought seed and clover and showed them how to prepare the land, apply the lime, and plant the clover. At the end of the season he had raised a ton and a half of good clover hay to the acre, and he had the satisfaction of seeing a good supply of clover come in, and for the first time those people saw good clover on those soils. Since that time the fertility of the soil has shown a marked increase and a great improvement has taken place; better crops of corn, potatoes and hay have been grown.

In addition to demonstrating the use of clover, and the application of lime, he went further and showed them what good cultivation would do. They had been in the habit of planting the potatoes in a slipshod way and letting nature take its course. He got some good seed, planted it, showed them how to prepare the ground and cultivate it, and how to keep the crop growing without any fertilizer at all and without anything except improved methods of cultivation. By that simple method he increased the yield of Irish potatoes to one hundred and fifty bushels to the acre. It was only a case where the man knew his business, and knew what could be done from working and living among that class of people. They had practically forgotten how to do those things properly. Needless to say these results have worked quite a change in that locality. Those farmers are looking brighter. They have got some hope in life. They have not got that hangdog expression they had once. The price of land has doubled in the last two years.

One other illustration of this class of work I am going to give you. Up in Broome County, New York, we have another demonstration worker there. One of the first things that he did was to organize the farmers into a cow testing association. I presume you good people here know what that is, so I do not need to explain. It was a great thing in that county. One of his tests showed that a certain herd of cows, numbering twenty-seven, produced a clear profit at the end of the year of about $200. The same record shows that if the man who owned these cows had killed all but the best dozen, his profit would have been $300. With only the best dozen he would have saved the labor and expense of the labor and feed of keeping the other fifteen cows, and would have had $100 to the good. Those are merely illustrations to show the success that we have had in this class of work. Now Congress has become interested, and it has come to be recognized that the method that we have adopted of placing men in a local area where he can study the farmer and his farm at first-hand is the best means (so far devised) by which we can get this work before the farmer. Congress last year appropriated

$300,000 to be used in placing local men in these local areas. The great trouble is to get the men. We have now established this work in a good many counties, and we have a good demand for it. In fact the demand for this kind of a man is much greater than the Department can supply. We have on hand now at the Department eighty-three requests, coming from different parts of the United States for this work. At the present time the Department has alotted in New York to carry on this co-operative work with the farmers $9,207; in New Jersey, $2,800; in Pennsylvania, $10,000; in Ohio, $7,000; in Indiana, $5,000; in Missouri, $3,500; in Michigan, $13,900; in Wisconsin, $3,000; in Minnesota, $4,000; in North Dakota, $3,000; in Iowa, $5,900; and the list shows how this money appropriated last year is being distributed among the different States. This method of co-operation used in this work is one which you both are interested in here. In most cases we have what is called State men, or men who are jointly paid by the United States and the State in which the work is being established. They have general supervision of all the work in a particular State. Next to these men come the county workers. Each county is supposed to put in an application for local advisers, and the county is expected to pay some of this expense. Up in Broome County, N. Y., where the first work was established, the Department puts in $1,000, and the Lackawanna Railroad puts in $1,300, and the County of Broome through the Chamber of Commerce at Binghamton, puts in another $1,000. We are paying the man there $2,500 salary, and he gets his expense in addition, which ranges from $600 to $800. Each one of these co-operative workers is interested in the development of the work, and so far it has been carried on with great success. The Lackawanna Railroad came forward with financial help, the Chamber of Commerce did the same thing.—Which is the first case on record where commercial bodies have offered financial support to such work. In Watertown, N. Y., the State Board of Agriculture helped out, I believe, by putting in $500 for the work, and the county authorities took hold of the thing. In order to get the amount of money to assist in this work they helped to put an enabling act through the State Legislature, so as to allow the County Commissioners to appropriate money for agricultural work, so that at the present time this co-operative work at Watertown is being carried on by the Department of Agriculture appropriating $1,000, the county with $1,000, and the State Department of Agriculture with $500. In addition to that the New York Central and Hudson River Railroad give the men their transportation and contribute $20 towards their salary. That shows the amount of co-operation we are establishing. To be sure, the railroads do not often go into it. Commercial organizations generally will take hold of this kind of work, and are they very much in earnest in pushing it forward.

Some of the other railroads in the country have also taken an interest in it. The Oregon Railroad and Navigation Company in Oregon, where we have a man located on that line, is helping us out. We have a man in that section who is working in several counties. In most cases, however, the Chamber of Commerce has established farm branches, or they enable the farmers to come in at certain reduced rates, which enable them to raise money to help in this work. We have yet to find a place where this work since its establishment has fallen through. It has been practically a success everywhere it has been established. I have at the present time about one hundred and forty men placed in local areas and we have on file eigthy-three requests that we cannot touch at all this year. A great many requests are being started, and eventually men will be put in these local areas. I think in many cases it will be before the end of this fiscal year. Now, I do not know whether I have made this clear or not. I would be glad to answer any questions which may occur to you. I realize that this is a pretty intricate subject to express unless you have been somewhat familiar with it before. At the same time it is a movement which is attracting attention all over the country. Congress has promised an additional $150,000, this year and with the ample co-operation which we have, that practically doubles the money received from Congress by the local people themselves, because, as I have already explained, the State usually contributes one-half of the salary and expenses towards the State which have charge of these demonstrations in the State. And we are also developing what is known as a boys' and girls' club work, which we are also sharing with the State on an equal basis.

Now, unless there is some question, I will close. I wish to thank you for your close attention, and I hope I have not kept you too long.

The chairman has asked me to explain something about the bills which are now before Congress. This appropriation which we got last year of $300,000 was a direct appropriation to the office of the Farm Management for the development of these field studies and demonstrations. That is the co-operative work which I have attempted to describe. In addition to that the States themselves are taking an interest and are asking Congress for a special appropriation for State help in developing the same kind of work. One of these bills before Congress now is known as the Lever Bill. That asks for an appropriation of $3,000,000, to be distributed over the country for the purpose of aiding this institution work. This bill has already passed the House and is before the Senate for consideration. It is believed that it is destined to pass at this session. Another bill which is something of the same nature is what is known as the Page Bill. I am not so familiar with that as I am with the other. They are both bills drafted with the intention to give the agricultural colleges federal help in the development of this work. Now, so far as these bills are concerned, if passed, they ought not to hinder the development of this county work, but give the States some ready money, which many of them do not have at the present time, and so help them to co-operate with the federal government in this movement.

THE PRESIDENT: I understand that our members of Congress are strongly in favor of this movement, and that one of these bills will probably pass.

It is now 12 o'clock and the meeting will adjourn until 1.45 this afternoon.

FIRST DAY — AFTERNOON SESSION.

Second session called to order at 1.55 p. m., Vice-President Wilson H. Lee in the chair.

THE PRESIDENT: Now if you will please come to order, the gentleman I shall introduce to you this afternoon is much sought after outside of this State as one of the most popular of speakers. He knows the dairy business from start to finish, and one of the best things about it, he has made good in it. I take great pleasure in introducing to you Mr. H. O. Daniels. (Applause.)

MR. DANIELS: Mr. President, Ladies and Gentlemen, and Fellow Members of the State Board of Agriculture: The subject assigned to me, "Selecting and Breeding of Dairy Cattle," is a very vital subject. It is a subject worthy of our earnest attention and our best efforts to do the best we can. And so in the limited experience I have had, and in the unsatisfactory way I can say these things I have to say in regard to this matter, I am going to try to talk on the subject assigned to me, "Selecting and Breeding of Dairy Cattle."

Now, in the first place, when we come to select a dairy cow, what are we going to look for? Are we going to look for a handsomely built animal, square-built, smooth and shiny, and a picture to look at, if you consider a smooth-built animal is a picture in the dairy mind. I am sure most of you who have had experience will say at once, "That is not the type of animal we dairymen are used to getting the best results from." The animal desired is built more on an angulated style, with sharp hip bones. It should not be poor, and the animal should be kept in good shape, but showing the bony structure in her conformation, so it is somewhat visible,—a cow with bony back lines, so that as you rub your hand over her back bone you can feel the indentations between each of the bones. You want a cow of a type that will show she is not putting all her food on her back, but is putting it into the milk pail, where it will bring you profit.

Then again we have been told, and I am sure it is absolutely correct, the dairy cow should have a wedge shape,—a wedge shape whichever way you look at her, whether from the side or beginning at the nose and going back toward the flanks; or from the top downward, so that it takes a wedge-shaped appearance, having a taper with a more sharp under-line, with a fairly straight back, but arched from the hips. The high pelvic arch is one of the things we want to look for. Then again, if you are looking over a cow, you should see how the ribs spread. She should have a wide, flat rib that goes out and then comes down in this way (indicating), something like some of our Connecticut dairymen after they have eaten a good strong meal. That is the kind of an animal we want to look for in a dairy cow. One more thing we must remember is a capacity for assimilating, storing food and digesting it. If we look at the animal from above she must be of a wedge shape just the same. So we might say this cow should be a wedge-shaped animal from every point,—in front, above, and on the side. That in brief is perhaps a crude way of describing the style of a cow that usually makes good.

We have seen other kinds of cows that have some of these characteristics in shape that have never made good. I think my friend, Mr. Hull, would say there are three kinds of animals known as cows: One is the animal that can take the food we give her and by a process known only to herself and the great Creator can transform the food into a profitable supply of milk; another kind of animal known as a cow will put part on her back, part in the trench, and not any profit in the milk pail; the third animal will take the food we give her and neither put it on her back, in the trench or in the pail, and the Lord only knows what she does with it. I am sure we have been up against that kind of a cow in our experience and we probably will do so again; but let us get together in concerted action if we can, or individually, and go as far as we are able, and try to eliminate that kind of cow from Connecticut. We have no use for her. We want an animal that will take her food and put the results of that food into the milk pail, so that when we get acquainted it will be a pleasure to continue with her company,—a pleasure for our boys and the hired men to help us in our work.

I am sure that we Connecticut dairymen have not studied this matter of breeding up our cows and selecting our cows as much as we ought to do. Now one of the things we want to look after is this matter of type, and then again we should take the scale and the Babcock test, if we are buying a cow and are going to depend on the butter fat she produces, and see that she comes up to a certain standard that we require.

I can remember some few years ago when I happened to be going by a cattle dealer's yard and he was just driving into that yard some cows he had unloaded from a train that had come from the State of New York. As he was driving those cows in there one cow among that whole bunch appealed to me as being a likely kind of animal. I asked the owner how much he would take for that cow. He named the price and I immediately purchased the cow, because I felt it was an animal worthy of experimenting with at least, and yet it might be risky to do that on all occasions. The animal might not be perfectly constructed in every point; it might have a defective quarter or something of that kind; but in this case the cow happened to be all right. We kept her a number of years and the work she did was worthy of the time that I had put in studying this type of cow previous to that time. She did make good, and when we came to put her into the stable and milk her for a series of years we found she was capable of taking the food we prepared for her and could turn that over in the process of a year's time,— I don't mean that it took a year for one feeding, but the food she would take in the course of a year,— and could roll up the average record of over 8,000 pounds of milk. That was for a year's time. That was the first eight-thousand-pound cow I ever owned, although we had some over 7,000 and some that approached 8,000.

Now about this time we began to study the idea of raising our own cows — that was seven or eight years ago. We bred that cow to a pure-bred sire of Holstein blood. The daughters of that cow were even better than the mother herself, some of them running as high as 10,000 pounds, and we have been satisfied that the ancestry in that animal, as the sire, was partly the reason why the daughters could excel the mother in her work. And then, still further, we bred the daughters of that cow until we had granddaughters that excelled the daughters of the cow, and so along those lines we believe the question of heredity is well worthy of consideration. So when we are selecting a dairy cow, if we do not know anything about her ancestors, let us do the best we can with the visible appearance in the wedge-shaped type and the highly organized system which we know must exist when we see such an animal. Then let us take that animal and breed to a sire that is better than herself. Mr. Diedrich of Pennsylvania, when he came before the State Dairymen's Association, used always to make this statement when he got on his pet theory of breeding the dairy cow: He said, "Every time you breed the daughter of a worthy cow that is to supersede her, breed her to a sire that is better than herself, and in that way breed up instead of down." I think that is true.

There are one or two other things which we look for in the visible appearance which are worthy of thought at times and which will bear out fair study and experience. And one is, if you see an animal with a good honest-shaped udder, and if you can see the prominent blood veins on the udder, you know in almost every instance when such an animal appears before you and the veins are very prominent that that is pretty good evidence that there is an active circulation of blood through that udder. That is one of the visible signs we believe should be looked after in order to make a selection. Then there is the milk vein that runs along and up into the body, and the opening is so large that when we come along and place our hand on the animal the finger will oftentimes readily slip into this hole known as the milk well. That is an indication and one of the exterior signs that can be looked for. I think it is true that sometimes you can pick out a good dairy cow in the dark. We have had men come into our barn, men of experience in the selecting of cows,—and they would go on down through the herd and almost invariably pick out the best milker. We know that is so because we have positive proof covering the work of the animal they select. The proof is there, the record of that cow. One of the great things we find of essential value in the selecting and breeding up of the dairy herd is in the individuality of the cow herself. We should study it and select our cows,—study them carefully and keep an actual milk record. When the cow is milked night and morning, with the use of possibly a fraction of a minute, a record can be kept on a sheet of paper of the amount of milk. Weigh the milk, record it, and have positive evidence of the work that the animal has done. Then follow that up every other day through the week, the month, and the year, and when the whole month's or year's work is added you will have your record. Then, if you keep her a series of years and compare one year of that cow's work with another, that cow's work will be a source of inspiration to you and your men. In my experience we don't do all of that work ourselves; sometimes we do a little, but this adding of the figures is rather arduous,—it would be for me, because it is rather difficult for me to study,—but we have children coming on who ought to make the most of their time, and we set those children to adding those milk records; and it is quite satisfying to hear them say this cow has milked so much this month, last month, and for the year, and we find it is an incentive for them to become acquainted with the individuality of the cows. And then we go a little further and pay them for it, and with the pay they receive for doing the work and the interest aroused it keeps us busy and has a worthy place in our system.

Now when we have found out the cow that produces the most milk, study the type, then see about selecting a sire. When we go out to select a sire for a herd do we want to take the first thing offered us, that is, the cheapest? Do we want to pass one that would cost us, a young sire, possibly $100 to $150 or perhaps $200, and buy one that would cost $15 or $20, as many do? We have had dairymen in our community who said they did not believe in this pure-bred business, but that they believed a grade cow would give just as much milk in a year, that they are hardier and can walk over the hillsides better and fight flies better than the pure-bred stock. They have tried to compare experiences along these lines. They have come to our barn and tried to buy grade calves rather than pay $25 or $30 for a blooded calf, or possibly more. Now we have had those men approach us, and finally we have swung those men from their objection until when they left the barn they were persuaded to purchase a pure-bred calf rather than a grade calf; because we have told them when talking about grade cattle that if they breed a grade cow to a grade sire they are going to get a scrub animal. I think that is the definition when a grade is bred to a grade. When we go to breeding a grade cow to a pure-bred sire the chances are we will get a grade cow; and if we keep on down in that kind of way, breeding a grade cow to a sire better than herself, we will soon get almost a full-blood, and when we get a full-blood I am sure we will get a perpetuation of some of the good qualities in the ancestors of the cow herself for future generations. So when we purchase a calf to put at the head of our herd let us not be content with anything that will answer to the name, but let us get a pure-blood.

We kept records for a number of years of our herd before we began to raise the cows which are in the dairy today. For six or seven years we kept actual records of the herd, purchasing all cows that entered into the herd, and in those six or seven years it is interesting to look back and add up the figures and find that there had been scarcely any increase in the amount of milk the herd produced, either individually or on an average for the whole. In studying these figures we find the average production ranged from 5,500 to 6,000 pounds per cow. We kept sixty animals for six years that kept about so and did not vary 300 pounds per animal. About that time we began to consider the idea of increasing the value of the herd by breeding up the herd, and we purchased a pure-bred sire. Then two or three years after that (about when we began to have heifers from the sire), when those heifers came into the dairy (there were nineteen of them), the first two years after we began to keep records of those added to the herd which we raised out of that nineteen there was only one that went less than 6,000 pounds, and the average went over 7,000 pounds per cow, and we began to see the increase was going to pay. The average of the herd was increased in proportion three to four hundred pounds per cow on the average, and in the course of three or four years we raised the average from less than 6,000 pounds to over 7,000 pounds per cow. Now I attribute that to two things: One is, we believe, we have a better herd of cows from those we have raised than we could have by purchasing, because with those nineteen cows we raised the average to over 7,000 in a short time and we could not have gone out and purchased nineteen cows to give that amount of milk for less than $100 a cow, as a grade animal, considering what grade cows today are worth. Now in the breeding up of that herd, in increasing along those lines, we have found in the herd there are something like thirty-five daughters of that first sire we purchased eight years ago. Out of the thirty-five cows, twenty-seven of them are in milk, and in going over their records in the past year or so I find those twenty-seven cows have averaged better than 7,000 pounds per cow. So you see there is opportunity for perpetuating that record; and yet I wish we could get up to some of the high records we read about.

You all know of the record the Messrs. Fields have made in Brockton, Mass., a record which today, I believe, stands at the head of all records in the world. A cow known as Crandel Vail gave 29,654 pounds of milk in twelve months past, and produced nearly 1,100 pounds of butter during that time. She holds the world's record for milk production, but has been exceeded in butter production. But to think of getting that tremendous amount of milk in twelve months,— nearly fifteen tons! That would be equivalent to ten average cows of Connecticut. I think it is said sometimes that the average production of cows in the State of Connecticut is something like 4,000 pounds,— that wouldn't be ten cows, but at least seven. In considering the keeping of seven cows to do the work of this one cow, is it possible to consider this cow as consuming as much food in the twelve months past as those seven average cows would consume? I believe that is not true; I believe that cow has been able to do the work on a good deal less than that. But it is a well-known fact that you cannot get something out of nothing, and it is certainly true that this animal has not been kept in a scrub pasture and on the limited amount of food the average dairyman feeds cows and expects them to do good work on.

So we come to another phase which is very essential, and that is we must feed this animal. We must begin by feeding this animal before she is born. I want to leave this word with you,— if we are going to breed up a dairy herd we must begin to assist and to feed our future cow before she is born. That is, we must feed the mother of the calf so that when the calf is born it will be well nurtured. And when that calf is born we must consider the matter of taking care of her. We must feed so that when the calf is growing it will grow right along from day to day without the appearance that occurs in a good many dairymen's herds in Connecticut,— such as in the barns where I have been, and in fact it has occurred in our own,— where the animals do not seem to grow, where they seem of about the same size six months later as at this time. That sort of thing is not conducive to getting animals that will produce a large amount of milk when reaching maturity. We want to handle them right along from day to day so that at the end of two years or two and one-half years we will have a well-grown, strong, active, vigerous animal. Then when that animal is entered in the list of the herd for producing milk, let us give her a name, so we will become familiar with her. Don't number her one, two, three, or four, but give her a name that is worthy of her. If you have a favorite name, or the young fellow has a favorite girl's name, or you have a favorite name in your category you have not been able to apply to any member of your family, then just use some of those names on the females in the herd in your dairy barn. You can use the names Mary and Susie and all those kind of names, which are very nice to look at. Of course if you get into the pure-bred Holstein names you will have something more. There are the usual German names, which are so difficult to pronounce and so impossible to follow out, except on the chart. That brings to my mind an animal we call "Millbrook." If you look back in the official book you will find a jaw-breaking name, but for the farm name we want one easy to keep in mind. Then let that cow grow up, and later when she is doing excellent work you can feel she has done her part to perpetuate what you wish you could have done in other ways. I know you feel a good many of your cows have not made records for themselves. But I want to refer you to Molly Holt; she is one of the grade cows in the Jersey breed; then there is — well, I forget those others, they have gone from my mind; but I have shown you what I mean; if you have a pet name you wish to perpetuate, put it on the dairy cow and let her do it. I think it will be a good thing to do.

Now when we raise this calf we ought to have a place for her; we ought to have a suitable place to raise the calf in. Don't let us make that calf come up in the back alley over behind the other cows, tied up in some dark corner. But let us have a stable that is light and airy and clean, so when the children go out into the stable they can see her, and when you take some of your friends to see the herd you will not be ashamed to show those animals. If they happen to have white hairs let them be white hairs and grow up that way. Let them grow up so that when they come out of that place and graduate into the stanchion row they will be of a size and cleanliness and development which will be worthy of our experience as dairymen here in Connecticut.

Then when we turn those cows out to pasture don't let us expect they can get a whole lot of good out of sumach bushes, but give them a good pasture, and I am sure it will pay. Give them a pasture that has food in it, so they can continue to grow right along. Then when they come to maturity I think we can feel sure we have done our part.

Then when they come to that point where we look for the future cow, when they have reached the development of maternity and get to the point where we expect they are going to do work for us, let us do the best we can. Let us fix up a box stall where they can be at rest when this time of stress comes on. Let us take care of her and keep her warm. I think some of the great difficulties we have contended with in the past and some of the great losses can be traced to lack of care at this time. Many men have not seen to the actual needs of the animal at this time, and there has been after trouble which has caused a tremendous amount of annoyance and loss. Now we have found that one of the most essential things is to keep the animal warm, to put a blanket on her if the stable is cold. Then we give her warm water to drink, even hot water, if you would term it such, although she will not drink very hot water. Give her water as warm as she will drink it. Give it to her and let it flush out her system at a time like this. Give her ten or twelve quarts and let it work through the system. It helps nature to throw off that which it should after work of this kind and makes the animal free and easy to go on and do the work which she is intended to do. We have all had trouble before now in regard to the after-birth not coming as it should, giving us a lot of bitter experience in the matter of having a profitable animal. I think we can almost eliminate that trouble or wonderfully help it by giving the animal warm water to drink so as to assist her.

I think it was Dean Cooke of Cornell University who told us that if we were going to flush a sewer we would not do it with a lot of drugs from the drug store but we would do it with water. So you can flush this animal by giving her good warm water to drink, and nature will do the rest. We have found that absolutely certain. It has worked out nine times out of ten without any treatment or medicine, and the cow has done well afterward.

There are one or two other ways in which the dairy cow helps us as farmers in this State, and one is the dairy cow helps us improve our lands. She helps us dig our ditches, not by hitching her to a plow, but she gives us the money with which to do this work in the selling of her product. If we find a profitable market for her milk, then with this money rightly expended we can remove the stones and hedgerows and get the fields in better condition to raise larger crops. When we have done that we can keep more cows, and the product from the stable will improve the fertility of the land. So there will be one perpetual scheme followed out. And I am sure on any dairy farm rightly handled we can increase the productivity of the land and have a very nice herd. By adopting the modern system of feeding the cows ensilage, by planting crops which will furnish them the proper food, by planting a corn crop for winter and spring feeding, raising clover, as mentioned this morning, and putting the clover crop in the silo, putting the alfalfa crop in the silo, and having the proper food to feed out during the dry season in the summer is a wonderful help in producing milk. So I say it is as necessary to consider the food for the animal as much as her selection, in order to get the cow to do the best work, and by breeding up the herd after the idea that we are going to look for something better for a sire year after year than the sire that preceded, if possible, we can surely look for better results than if we did not give that serious consideration. When we get to a point where we do not consider the value of the sire any more than that of any kind of a blooded sire will do I am pretty sure we will be going on the downward road; but when we get something better, that will transmit good qualities, and keep bringing those into the herd, I am sure we will get better animals than those that preceded.

There are two or three more things that I would like to speak of. One is the matter of feeding so we can get more product from our cows. It has been stated that if an animal produces 5,000 pounds of milk and we sell it for 4½ cents a quart it usually just about turns the wheels of the farm machinery. I think that is true, although I think at the present time it would probably take 6,000 pounds of milk. That means about 2,800 quarts, which at 4½ cents a quart you can figure out and see about how much income the herd will produce. Now the cost of feeding that cow, with the present prices of products which enter into the composition of milk, the hay and products raised on the farm, the grains we have to buy, the labor bill which enters into the care of the herd, the investment in the animal and the stables and all that sort of thing, (the expense of operating the herd) and you will find it will figure up close to what we get for a 6,000-pound cow at 4½ cents a quart for milk, if we don't make any profit and only pay for the food consumed. If fairly decent market rates are gotten for the products from the farm, and purchasing the grains we have to buy, if there is something more than a dollar or two left the 6,000-pound cow is just about turning the wheels of the machinery. But if we get a cow that produces 10,000 pounds, with the little more grain we have to buy we will find that the 10,000-pound cow is more than twice as profitable as the 5,000-pound cow. In our experience and in talking with other men on this subject we are satisfied that the animal that will produce

10,000-pounds is about sixty times as profitable as the cow that will produce 5,000-pounds. In other words if the 5,000-pound cow will give $1 in profit the 10,000-pound cow will give about sixty times as much profit, because she will give about $100 more gross profit, and the extra expense will be about $40, so on the 10,000-pound cow, if it was possible to get a herd like that, we can look for nearly sixty times as much profit. Now why don't we have a herd of 10,000-pound cows? Is it impossible to get such a herd? I am not ready to answer that question just yet. It is our aim, or I might say we have set our standard at 8,000 pounds. We have gotten by the 7,000-pound mark at the present time and we are in hopes we can reach the 8,000-pound herd. We have reached half that amount with the herd at the present time. That is to say half the herd is producing an average of 8,000 pounds and the other half is not, so we have not reached a continuous production of 8,000 pounds. How are we going to get the balance of the herd up to that point? The only way I can see is to cull out the cows more carefully than in the past, breeding those cows that will absolutely prove in their progeny what they have done themselves. If we can get cows to produce 10,000 pounds and can breed to same we can hope to get progeny that may produce more. The only trouble is that with cows in service the average life of the cow raised at the present time is only about six years on the dairy farm. The average life of the cow we purchase is about three years. The reason is we will buy a cow that is six or seven years old when we buy her, while the cow we raise commences to be of service when she is two or three years old, and we thus get two or three years more out of her.

We have got to study those things more thoroughly and have more incentive for doing the thing in a right way, so we can take better care of the cows and get better profits. A cow that produces 10,000 pounds of milk needs a tremendous lot of care. It needs more care, as the farmer down here says, than his grade herd which can rough it on the hillsides and do fairly well or better than the pure-bred cows. Those 5,000-pound cows don't get as much care as the 10,000-pound cows. And if we don't give the 10,000-pound cow any more care than the 5,000-pound cow we can't expect she will continue a 10,000-pound cow. It takes more time and more labor, while labor today is very expensive, as you all know.

I wish I could give you some easy way of overcoming that difficulty, but I am unable to do it. The only suggestion I would make is for the dairymen of the State of Connecticut and all New England to raise their own care-takers as far as they can. That will help it. (Laughter.) We are depending too much upon the sunny sons of Italy, and it is high time the American race began to think of these things and look out for the future more than in the past, and I think you will agree with me on that.

There is just one thing more in this care of the cow. After we have arranged to feed her as we ought, then we should provide a good, clean, light, sunny stable. Have it well ventilated so the air will be pure, and so the air will change from one hour to another, going entirely through the stable. That is possible to do and it can be done with the King system of ventilation. When that system is well established and when the openings for outlet and inlet are properly constructed at the floor and at the roof, the taking foul air away from the floor so it will go up from the end of the barn and from the center of the stable,—when those are properly constructed after the fashion of the old-fashioned chimney with the open fireplace, when that system is arranged in our stables and the air is changed from one hour to another,—I am sure we can make a home that will be a healthy, desirable place for the cows to winter in, and they will do better work than in many dark places where cows are kept at the present time.

So with this idea, in connection with the other things that enter into the selection and breeding of the dairy cow, of which I have in a limited way spoken to you, I want to close and to thank you very kindly for your attention. (Applause.)

THE PRESIDENT: I think you will agree with me when I say that we have right here in Connecticut, in the person of Mr. Daniels, a man who can make good. He has referred to the sons of Italy,— my friends engaged in market gardening tell me they are making a great deal of trouble. An American who can make a success of market gardening today must certainly do it in an up-to-date manner, and we have a gentleman here from New Jersey who will talk on that subject. Mr. Hulsart. (Applause.)

MR. HULSART: Ladies and Gentlemen, following behind the talk that you have just heard makes one feel a little bit weak-kneed, coming as I do from down on the New Jersey sands up here among the rocks and hills of Connecticut. I want to say at the outset, I do not feel to be entirely a stranger in Connecticut, for I lived here once for a whole year. I know something of one of the counties in Connecticut and that is Hartford County.

The topic on the program reads, "Down-to-date Market Gardening." I have rolled that subject over in my mind a number of times and this thought comes to me.—Once in our county there was a lawyer summing up a celebrated case and he made this remark, "If your fore-sight was as good as your hind-sight you would know more a blamed sight," and I feel there is a good deal of truth in that. If we could look ahead in market gardening as we can look back some of us might make an extra dollar, but under present conditions we don't always do it. We have more to contend with, I believe, than any other branch of farming. With all due respect for the other man who has just been talking about the dairy cow I feel that the market-gardening man who is trying to raise perishable products has got to be a different type of man altogether. He wants a knowledge of chemistry, botany, zoölogy, and several other ologies, together with one none of us know about and that is climatology. If any of us knew what kind of weather we were going to have the next season we could plan with a better degree of success than we can when we don't know. That brings us back to our foresight being better than our hindsight.

Friends, I come, as some of you know, from what some of us call the "Garden State." Some of you call it the "home of the mosquito," the "birthplace of trusts," and such things; we call it the "Garden State," when we are talking to somebody, at least.

Now, friends, I have been in this line of farming for over a quarter of a century and there are a few things I feel I have found out. I want to say this: There are many men (and I have been an eyewitness to what I am going to say) who think they can grow market-garden crops who have been in other branches of farming, and they will start out and try to get some of the money some of us fellows have in our pockets. Now most of us who succeed in making an extra dollar are just as smart to keep it as to get it,— hence they don't get those dollars. I remember a few years ago when the asparagus craze went through New Jersey. Many men growing general farm crops went "asparagus crazy," to use a common expression. They soon found out that it did not work out with the class of farming they were doing. That has all been cast to one side. I might name several other crops along the same line. The man who is going to be a farmer of market-garden crops is an individual all by himself. There are general farmers, dairy farmers, sky farmers, but none of them are market-garden farmers. Not one time in ten does a business run alone by itself, and a man who is going to make a success of it has got to be heartily in love with it, and further than that he must not be a soil robber, he has got to be a soil feeder. Second, he must know his crops, he must know his soil, and he must know whether those crops will thrive on that particular soil, then he must know how to produce the crop. He must also know whether he has a market that will give advanced prices for the production, and whether he can get his product there in sufficiently good shape to make sure that people will buy it. All those things must be taken into consideration; and yet we find in my own State every season men who will start out after money that somebody else has made on that same particular crop when they have had no experience whatever in trying to produce that crop.

One of the crops I have in mind at the present time is the cantaloupe. That is one of the nicest crops a man who is in love with the cantaloupe and who understands how to raise it ever attempted to grow, and one of the crops that won't grow for the man who has been growing all other farm crops and never tried this.

This is random talk, but down-to-date market gardening. When are we going to get down to date? I feel there is considerable yet to be learned before we get down to date. We have been growing certain crops in our section of the country for a quarter of a century, nay half a century, and about the time we think we have gotten onto how to grow a maximum crop for all time something will come along in the way of climatic conditions or otherwise so the whole theory will be upset. Then we have got to start over again along some different line. That brings us back to when are we down to date,— do we know? I am afraid we do not.

But first there are a few principles in the growing of some of the crops we raise in our section of the country that I am going to talk about. The farmer who tries to grow these crops the same as the average farmer does other farm crops is almost certain of failure. Fertility is one of the main problems to be considered in the growing of market garden crops. I have heard men say, "If it will grow corn it will grow anything." Let me illustrate. It takes about the same amount of fertility to grow 2,000 bunches of asparagus, of three pounds each, as it does two tons of Timothy hay. The 2,000 bunches of asparagus will take out about the same amount of fertility from the land as the two tons of Timothy hay; yet it takes four times as long for the Timothy to grow as it does the asparagus. Why? The hay has the whole twelve months to seek food and it grows slowly, while with the asparagus you have got to do it in sixty or seventy days, by storing up the fertility in the roots of the plant between the time the cutting season is over at the beginning of July and the time the plant goes into winter quarters in the fall.

With this line of farming I cannot liken it to anything better than an express train on time. The average farmer has got all the season to grow his crops in, but the man who is going to grow market garden crops must be out of the depot on time and he must make every stop on time and arrive at the destination on time. What I am driving at is just this: The man who does not start with his neighbors, who does not do everything to promote the rapid growth of the plant by manures, cultivation, and supplementary applications of concentrated fertilizers, who is not ready to gather that plant on arriving at destination on time is going to lose, and the fellow who is a little faster will win. Now, for example, in market gardening you have got to use glass. That means a hotbed or a greenhouse. A man wants to be prepared to start at just the right time, and nothing must interfere. Everything wants to be in working order all the while. The young plants must be grown at the right time and transplanted at the right time.

In the preparation of the land we come to the main subject. This is a vital thing,— the preparation of the land. In market gardening it is not only plowing and harrowing, but it means manure and fertilizer as well as plowing and harrowing. It means humas. Friends, it is a well-known fact that land can be made warmer by a greater amount of humus in the soil. Anything we have that is decaying warms the soil. It is up to the market gardener to know these things and be prepared. No man can grow a market-garden crop and grow it rapidly in a soil that is in a depleted condition. The market gardener has got to use quantities of stable manure, or cover crops. Friends, I have become a crank on cover crops, and stable manure is becoming higher all the time. While the previous speaker was talking about the three different types of dairy cow the case came to my mind of a man we ran across in institute work last winter. He was keeping sixteen or seventeen cows and he was not getting enough milk to pay the feed bill, but he said he had to have the manure, so I guess that is one of the cases where the food goes into the manure pile.

Friends, with us large quantities of stable manure are bought and applied to the land in order to warm it up and feed it for these truck crops. For the last three months I have been traveling through the market-gardening districts of the State of New Jersey, particularly the western part, Gloucester County, which is one of the leading truck sections there, together with Burlington County, and at the present time practically every one of those men are carting city stable manure by the carload and applying it to the land, getting ready for their next spring's crops. With that quantities of fertilizer are used, as high as half a ton, and sometimes as much as a ton to the acre for some individual crops. Now these men have a friendly rivalry one with another, trying to see who can get in the market first,— there is your express train traveling again. One man in particular told me about a neighbor who used a large quantity of stable manure for sweet corn, and he said that was done on purpose to "get him," and he did so. I very often think that usually the more such fertility the market gardener applies to the land, together with the supplementary application I will talk about later, the more success a man is liable to reach in market-garden farming.

Some years ago in growing cantaloupes in the early part of my farming a gentleman said, "Friend, if you are going to try to grow cantaloupes put the greater part of your manure on the land broadcast. If you can't afford enough put it there and see what the result will be." I concluded we would do it both ways. But since then we have eliminated the placing of manure in the drills or rows for market-garden crops, practically entirely, and in my travels through the State there is scarcely a market gardener who uses the old-fashioned method of putting stable manure into the row or drill to grow a market-garden crop. This method places it all over the ground, and that is where it should be. You might as well tie a peck of oats to a mule's hind leg and expect him to get fat as to put all the food under the plant and expect the plant to do the best all of the season. The root system soon reaches out beyond that and is all over the ground.

Now, friends, there may be a number of individual crops that you people are interested in that I do not know anything about. If there are some crops that you would prefer I should talk about rather than to take a chance I would be glad to have them named, and if they are crops I have had any experience with I would much rather talk about them than to waste time talking about something that may not interest you.

I would like to say in the meantime that one of the greatest errors in market gardening is to practice the planting of the several crops with commercial seeds. There may be seedsmen present, but I can't help it. The market gardeners in my section of the State, and I think the whole State, would no more risk their moneyed crops with commercial seeds than they would risk their families among a flock of wild beasts, I might say, as radical as that. The main crops are produced by men who breed or save their seed, and they are saved from the best ground on the farm. In my own section of the country, where tomatoes are one of the main crops, you could no more get a farmer to send to a seedsman for commercial seed and risk his acres with those seeds than nothing at all. I have known men to ride half a day when they were short to buy seeds from neighboring farmers rather than to risk their crops with commercial seeds. Why is that?

The commercial seed is not bred. You have listened to a talk for three-quarters of an hour on the breeding of the dairy cow. It is just as important, friends, the breeding of vegetable seeds as the breeding of the dairy cow. To emphasize that fact, a few years ago I had a friend who was breeding the cantaloupe for thickness of flesh. He carried that so far by breeding that he had to stop and let it run back, because when the melon began to ripen it would crack at the blossom end. Any of you know that the thicker the meat the quicker it will crack at the blossom end, and a thin-meated one rarely does it. I am acquainted with the young man, and I have the same man on the farm who won the five-hundred-dollar cup at the exposition in New York City last Monday.

We are growing the pepper in our neighborhood, friends, and Dr. Tracey was at my house a year or two ago and said it was remarkable to notice the pepper fields in the distance of travel from another farm to mine, (about a mile and a quarter). I am going to bring out another point. Everybody seems to think they have a certain variety of pepper and that they are all separate. Now, friends, they originally came from the same thing. They were put in each farmer's hands and each farmer has selected those seed from his own particular view-point for probably eight, ten, twelve, or fifteen years, and each man has gotten a type of his own. They all came from the original seed, yet they are just a little different, but none of them could be bought in any seed house in the country.

Now, friends, so much for the seed. When you have gotten the right kind of seed, started at the right time, manured in the right way, the land prepared as good farmers will prepare it to receive the crop, there is something left yet in the market-garden business to be done,— to hurry things along. Some years ago I ran some experiments for the New Jersey Experiment Station on the feeding of market-garden crops with concentrated nitrogenous material, to see what crops would take it in the different forms and what kinds were best adapted to raise maximum crops. Now those experiments were all run solely to find out what form the different crops required it in, and the amounts to be used to get maximum results. Now these experiments were carried on for some three years; and some of them three, four, and five years, and the asparagus experiment the whole life of the crop,— some seven or eight years. We used blood, sulphate of ammonia, nitrate of soda, and combination of all three. There are several bulletins published in our State covering it, and they can be had for the asking, I think. Those experiments were carried on for two, three and four years and, although some of you may think there was fertility enough in that soil to grow a maximum crop, yet those supplementary applications showed great results in some instances, and with some kinds in almost every instance. Nitrate of soda gave the best results as a supplementary application. There was one instance in which the sulphate of ammonia did almost equally or quite as well as did the nitrate of soda. But the organic forms of nitrogen failed. Why? Because they had to go through the chemical changes and be transformed or broken down from organic material into nitrodes before the plant could take them up, while in applying the nitrate of soda just as soon as it was dissolved it was plant food. The market gardener is a man in a hurry,— he wants to get there as fast as he can. If he puts on any form of organic nitrogen the plants have to wait, whereas if he puts on nitrate of soda it is ready for the plant at the time when it is needed most. We used it on cantaloupes, peppers, carrots, cucumbers, asparagus, and a number of crops. With every crop, with the exception of sweet corn, nitrate of soda took the lead practically every time, and one season it was ahead with sweet corn for the very reason I have given.

Now, friends, the man who is trying to grow market-garden crops pants early crops, and they are the only ones I am thinking about. In our section of the country there is no double-cropping. It is a case of a man's starting just as soon as the frost is out of the ground and trying to hurry that crop first into the market. He starts that crop at the earliest possible moment, pushes it just as fast as possible, to get it there just as quickly as he can to get the money out of the crop before the market falls. We are up against this proposition: Everything is sold into the open market, and the man behind has to take the lower price for his product, —lower than the man who is ahead,— hence he gets there just as quickly as possible.

I might give you those experiments, as I started in to do. We used soda phosphate and muriate of potash (mixed three to one) as a mineral fertilizer,— as a bank account for that crop to draw on. Now all of you know the mineral plant food in fertilizer does not wash out, but becomes fixed. It lies right there for the plant to draw on, just the same as some of you draw on the deposits you have in the savings bank at the time of need, whereas the soluble nitrates will wash down, and I happen to know there are some sections in this State, as well as in my own, where they will go a good ways if the rain comes in sufficient quantities. There are sections, you know, in New Jersey where a drop of water will travel faster after it hits the earth than before it got there. (Laughter.) And while that may not be the case in Connecticut, I know of a section where when it does get down it is pretty hard to bring it back. The ground is sufficiently porus to let the water down, but the capillaries are not coarse enough to let it back.

Now with market-garden crops planted on soils liberally supplied with mineral plant food, phosphoric acid and potash, then using soluble nitrates to promote vegetable growth, with that to draw on from time to time as they need it; and whenever they need it light applications of soluble nitrates applied from three to five weeks apart to keep up the vegetable growth, you have a method that takes care in part at least of the climatology problem of which I spoke when I first began to talk. Otherwise the plant would not get nitrates any faster than nitrification takes place.

Now there are a few other things to be considered in the planting of early crops, in the preparation and handling of the soil. I want to give you an illustration of something that happened a few years ago when we had a fifty-two days' drouth. I was about ready to plant a field of carrots just after we had received a two-and-one-half days' rain, but it cleared off with the wind blowing quite a breeze. I saw the soil was drying out quite rapidly, and it occurred to me, suppose it does not rain, will that carrot seed sprout and grow. I put on a roller (a two-horse roller) and rolled it down smooth. I accomplished two things,—first, I kept the water close to the surface. Some will say this is not the teaching of the scientists, to keep your soil mulched in order to keep the water from getting away, and I say so too after the plant has sprouted, but I wanted to sprout those seed. Unfortunately it did not rain again for fifty-two days, and that was the only acreage of carrots in my neighborhood that came up that season, and I might say that it was pretty nearly as much by accident as it was by knowledge. Just as soon as the plants were through the ground I shot the cultivator through to conserve the moisture. On light sandy soils water counts far more than fertility at certain times in the year. I have seen many a time with market-garden crops where fertility was not the only question by long odds; it was watching the heavens for a cloud that had water in it. If we have water we can get the maximum crops, but without it it is impossible to get good results, and yet by the application of stable manure and the plowing under of cover crops we can help the situation. I have had hard work two or three times to keep the words crimson clover out of my mouth; I know we are too far north, but I am a crimson clover crank. If you plow those clover crops the manure under neath will warm up the soil, and then comes cultivation. I saw down-stairs since I have been here on one or more cards a note that that corn was cultivated twice. I am surprised that the man did not grow weeds instead of corn. (Laughter.)

In order to save the moisture to grow the crop the cultivator should go through not less than once in seven days, and sometimes oftener if heavy rains occur. But we make it a practice, not myself alone, but practically the whole neighborhood, to go through our crops at least once a week, and I have remarked a number of times that with each farmer running his own farm and each one attending to his own business you will find seven-tenths of the farmers of the neighborhood doing the same work the same day if you happen to be riding around.

This is a kind of general random talk and I wish if you are interested in any of the crops we grow in the State of New Jersey and have any questions you wish to ask you would do so. It would please me better than to talk in the manner I am doing. Aren't there any market-garden crops you are interested in?

QUES. How do you get the rich, fine flavor of cantaloupes?

MR. HULSART: By food from one viewpoint and sunshine from another. With all the food you can give to the cantaloupe, if you have not the sunshine, it is impossible to get the flavor. But a combination of the two, together with good cultivation, will give you the flavor every time. Now what makes the Rocky Ford cantaloupe have a much more superior flavor than the Connecticut or the New Jersey melon? Simply because it has ten days of sunshine every week. (Laughter.)

That is true, according to labor rules. The sun shines out there fourteen or fifteen hours a day and is never obscured. When the plant wants water it is applied just as practice shows it is needed, and when the sun is shining on the earth that has been prepared, manufacturing sugar from the carbon the plant is taking in and sending it down to the roots to mingle with the soluble plant food that has been placed there by the farmer, where it is dissolved by the heat and water and then brought back and put into the melon as sugar, then we, the farmers, can do considerable toward getting flavor into the cantaloupe, but if the one who supplies the sunshine fails to give us a sufficient amount of sunshine for the plant to do this work I defy any man to get flavor into the cantaloupe or to get the proper percentage of sugar into anything he grows. It takes sunshine with right feeding to make sugar. I have been a cantaloupe grower for a quarter of a century, and some seasons we can grow cantaloupes that will hardly keep nights (because the boys steal them), while other seasons we can let the hogs out and those cantaloupes are there yet. (Laughter.) Take a season when it rains every other day and the sun is obscured part of the time, — we had a season when we had ten days' rain in one week,— it is impossible to grow the right flavor into the cantaloupe.

I have just returned from a section of New Jersey where they are growing asparagus in large quantities, and it is astonishing to see the results those men are getting simply by knowledge of the crop, the way it is planted, and the amount of fertility that should be placed under it. I have records from two farmers that have reached in the past season an average of nearly $500 net an acre, getting 3,000 three-pound bunches to the acre, and I saw a field where they are applying stable manure at the present time, and they will have applied a ton of fertilizer to the acre between now and the time the cutting season is over.

Now, friends, there are some other things, if there don't seem to be any individual crops you would like to have me speak about.

QUES. How about celery?

MR. HULSART: What would you like to know about it?

QUES. How do you store it?

MR. HULSART: In trenches in the soil in our section of the country. We dig down far enough so the leaves will come to the top of the ground, and fix an A-shaped crib backed with soil. Both ends of the trench are kept open until such times as you think it is going to freeze. This is to bleach it, for the green varieties; the white ones hardly ever keep long enough in any trenching. Then, as the weather becomes colder, cover it with litter or horse stable manure and it will keep in our section of the country clear up to the first of March.

Now, friends, in the handling of different market-garden crops there are some things to be thought of that I have not seen taken into consideration by a great many farmers. One is rotation. Now we read in the agricultural papers all the while about rotating with general farm crops, but we rarely hear anything about rotation with market-garden crops, and I believe it is more important than with the other crops.

The average farmer does not stop to think about this rotation and the kind of crops with which to rotate. For example, about 1875 there was an insect that came here from Colorado that soon found out that the potato, the tomato, and the eggplant all belonged to one botanical family, and he would eat either one, and that was the Colorado potato beetle; and there are lots of farmers who have not found that out yet. The same insect pests and the same fungus diseases follow a number of our crops, and that ought to tell us they are not the proper crops to rotate one after the other. Then too there are a number of other crops that take largely from the soil of different plant elements that should not follow one after the other; for example, the carrot and the cabbage and several other of the potash-consuming plants. If a man follows one after the other sufficiently long he will deplete his land of available potash to such an extent that he will begin to wonder what the trouble is. It is simply because he has been following crops of potash-consuming plants one after the other and has depleted the soil of potash so it will not produce normal crops.

QUES. Tell us briefly how you recommend fertilizers for the cantaloupe.

MR. HULSART: My practice has been first to either plow under the red or crimson clover, or ten or twelve loads of barnyard or stable manure. Only one of these fertilizers is needed. Then on the rough, plowed furrows drill in about a thousand pounds of soda phosphate and potash mixed together (three parts soda phospate and one part muriate of potash). This should be done sufficiently far ahead of the chloride, which is of a salty nature, to stop its washing out the muriate of potash. Drill this on the open, plowed furrows and turn it into the ground, for the more you get it into the ground the better it is. It should not be put on top of the ground and it should not be put too far below the surface.

Fixation begins the moment it strikes the earth, and if fixation takes place on the surface the plant has to come to the surface for it. The best depth is three or four inches below the surface. There is not a much better implement than the disc or cutaway harrow with which to work it up.

By the way, I spoke briefly of the express-train business. Let me show you where you can get a little ahead of time with this particular crop. In preparing a field for cantaloupes if you will put a row together like a double-pitched roof, running east and west, planting on the south side of that row, it leaves a protection on the north so that the seed will sometimes sprout and come above the ground when the north side has a frosty crust on it, whereas if the seed is planted on a flat surface with the cold winds passing over it oftentimes will not sprout, but decay. Further than that, many of you know that the cantaloupe seed is very tender. It will not stand a great deal of rain while in the soil and if the soil becomes saturated the seed will rot oftentimes. When planted on the flat this will happen, but when planted in the way I have mentioned the rain will run off. They will grow better planted this way than on the flat and oftentimes a week or ten days sooner.

Now as soon as they are properly planted and before they are up we have something to contend with,—cutworms.—Perhaps you don't have them up here. (Laughter.) I have found them in some of our crimson-clover sods so they would shake out faster than you could count them. We use bran and Paris green in New Jersey (one pound of the Paris green to fifty pounds of bran). To make sure I make it one and one-half pounds of Paris green to fifty of the bran. Perhaps you have used it and mixed it with water and molasses, but it was not necessary. Use it dry, it is just as good. If we had no insect pests that would give more trouble than cutworms will after we have applied this application I would be glad to buy the biggest American flag there is and fly it to the wind as the banner farmer of New Jersey. This will eradicate almost all the cutworms. A few years ago we had a lot of them on our farm. I dug a hundred and twenty-four one morning on the asparagus ground. I plowed a piece of clover for cantaloupes and you could get them anywhere. A few days after that I put on this application and a week later the plants came up and we didn't lose a hill, although we did lose now and then a plant out of several hills, but we didn't lose a whole hill, and I believe firmly if we had not put Paris green on there the crop would have been ruined. If you put this on the land when there is nothing else for the worms to eat they will crawl around there early the next morning and it doesn't take but a little to put them out of business.

That same season I used some on asparagus. There came a little shower afterward, and at cutting time you could stand anywhere and count from fifteen to twenty dead cutworms, besides what were buried under ground, for they will crawl under ground if life lasts long enough.

QUES. How about having poultry around?

MR HULSART: I have used it all around the buildings; our chickens are trained. (Laughter.) To use an illustration: We have the best poultry down there that money will buy, so far as the sires are concerned, and they are damned by about everybody in the neighborhood. (Laughter.)

No, friends, poultry will not eat this. I have been afraid of it myself, but I never have had any poultry poisoned with it. But, friends, when you use it keep it away from the hired men, not particularly on account of the hired men themselves, but for fear they will give it to the horses. One of my men fed three horses Paris green and bran three years ago and I came near losing all of them. If there is any left never bring it back to the buildings, because if there is a hired man around the place he will manage to get it. I had about a peck left and thought it would be good to use somewhere else, and if one of those fellows didnt' hunt around until he found it. He dumped some corn on it, and when the horses got down to the bottom they got a dose. It took a veterinary surgeon to bring them out. We did not lose any of them, but one was sick for nearly a week. The best thing to do is to dump it out in the field and cover it up.

Now, friends, another thing perhaps you don't have any bird depredations, but that very same season when I had to Paris-green and bran the sweet corn in order to keep the cutworms away one hill was missed by the men who were putting on the Paris green and bran, and that was pulled up by the birds. It was the only hill in the field that was pulled up by the birds. A little oval-shaped spot near a wooded section did not come up, and we planted it over, but did not use Paris green. The birds pulled it up. Mr. Crow and the swamp blackbird won't take it if you put a little on the hill. They are afraid you are playing tricks on them. You not only destroy the worms, but you scare away the birds.

Now, the striped beetle is a hard bug to kill, but you can insult him. Now take land plaster, gypsum, lime, and fine, dry, ground fish guano because it acts two ways,—as a fertilizer and as a repeller. Anything that smells bad insults him, and he leaves. Take gypsum and lime and add a few drops of carbolic acid and dust it on the leaves, and usually it does the work. Whenever I can get it I use fine, dry fish guano. That has a fishy smell, and when it gets wet by the dew it smells beyond words, and the little fellow flies away. It is almost impossible to kill him; you have to work on the same principle as with the San Jose Scale, by contact. He is a "hard-shelled Baptist," and you have to hit him hard.

That ends the insect proposition. Then the cultivation of the cantaloupes should begin almost as soon as they are through the ground. The faster they grow the more you make. You have got to feed them and attend to them, and then with that sunshine I talked about a while ago you will get cantaloupes.

Now my practice has been to apply nitrate of soda alongside or around the hill about the time the first natural leaves on the cantaloupes were the size of a quarter, and some the size of a half-dollar. It starts them growing. We keep this up, and at the last cultivation, when the vines are two and one-half to three feet long, and the melons are forming (about the size of hens' eggs), we put on some more. We have this half-organic nitrogen, fish, or concentrated tankage. I haven't said blood,— I am not going to. Those experiments I spoke of showed that blood is not the form from which to get your nitrogen. The plots that had blood were the poor ones, and the same thing existed in the tomato experiments. In the cantaloupe sulphate of ammonia slightly exceeded nitrate of soda, and personally I believe it makes but little difference which one of the two you apply, provided you apply it in time for food. There is not much more than two days' difference between them in what can be seen so far as color, etc., is concerned when a plant is taking up soluble nitrates from soda or nitrate of ammonia. I have tried them side by side. This is the way we handle cantaloupes, and, as I say, if we have the moisture and sunlight we will have cantaloupes.

QUES. How do you check blight?

MR. HULSART: I don't. It is too hard. We can stave blight off sometimes a few days or a week. But to say you are going to eradicate it or that you have an absolute remedy for blight,—well that remedy doesn't exist. I was reading something the other day from the Department at Washington, where they were telling us what they had as a remedy for blight. They haven't any. Now Bordeaux mixture with three pounds of bluestone to fifty gallons of water and enough lime to make a mixture, applied to the leaves (and being particular about keeping them fairly well covered), will very often keep blight off sufficiently long enough to to get two-thirds of a crop. But if blight is prevalent I have never seen the time when the patch would die a natural death without showing signs of blight. I have seen times when the first-sprayed fields were the first ones to show blight. Blight never shows in our section of the country sooner than the twentieth or twenty-fourth of August. When it does appear the growers start the first thing in the morning and try to get all of the crop they can to market before the blight gets there. Some of our best growers claim one spraying of this mixture will take care of blight, provided you know just when to put it on, but nobody has yet found out when this is.

QUES. What is your remedy for the white maggot in the early cabbage?

MR. HULSART: I don't grow it for that very reason.

QUES. In what instances will it be best to apply fertilizer otherwise than broadcast by harrowing it in? From what we are finding out it seems to me this is an important question. I have read a little on the onion and its production of roots.

MR. HULSART: My friend, my judgment is that when onions are planted the fertilizer wants to be all over and all through the ground, because the onions are planted very close together and I do not suppose there is an inch of soil literally to the depth the onion root goes which is not taken up. Hence I should say the fertility wants to be through the soil. I am not an onion grower.

QUES. Have you any remedy for these white grubs? We have had a great deal of trouble in Connecticut with white grubs. They turn into June bugs.

MR. HULSART: You will have to go to an entomologist. I don't think I know the insect.

QUESTIONER. You will if it comes down there.

MR. HULSART: We won't lay awake nights until we meet him and then feel sorry he doesn't stay.

QUES. Would you recommend one, two, or three plantings of cantaloupes in this climate, which necessarily would not be quite as early as your crop? I understand some plant about a foot apart, a week or ten days apart.

MR. HULSART: We have not done that since we adopted the plan of planting on the south side of the ridge.

QUES. Do you plant by hand?

MR. HULSART: Individually with the Planet Junior cultivator with two plows. You want the longer side of your ridge to the south. It must be made east to west. Prior to that I used to plant every seven days; first, right in the center of the hill; second, the west side of it,—you have got to have something uniform,—and the third time, if necessary, on the east side. Sometimes climatic conditions are such you are very lucky if you get a perfect stand after all three plantings. On other occasions I have seen we would have a warm spell, and they would all come along together some time in July. In planting on the south side of the ridge I have not followed this method.

The best way is to plant twice at the same time,— I forgot that part of it. Take half of your seed, put them to soak in warm water over night, borrow a stocking leg, put the seed into it, and let the water drain out, wrap them up well, and keep them wet for thirty-six hours longer. By that time you will find the shells all cracking. Mix them with the other half of dry seed when you are ready to plant and you will be putting in two plantings. When you cover them it is impossible to cover all the seeds the same depth. Then if dry weather comes you will get the deeper ones; if wet weather you will get the shallow ones, and if neither we will take the intermediate. (Laughter.) We do it with the foot and when you cover them it is absolutely impossible to cover them all the same depth. I have seen farmers trying to figure what out is the proper depth, but you can't do that. What is the proper depth this week is not the proper depth next week.

QUES. You use your foot and don't use a hoe?

MR. HULSART: Personally I like a hoe, but a great many do not. I know a number who do not take a hoe into the field at all. Personally I like the hoe better. I do not like to use my foot for what a hoe was intended to do.

QUES. What is the quickest way to ripen tomatoes?

MR. HULSART: Let them grow until they are ready to ripen. We have no artificial way, my boy. Let them get ripe on the vines. Now, to answer that question in a different way from what you intended, have plenty of soluble phosphoric acid in the soil and they will ripen sooner than if you have a minimum amount. That has been my practice for a number of years,— to have at least half as much again as is necessary to grow the crop,— and I will guarantee they will ripen.

Are there any other questions?

QUES. Is there anything that can be done to prevent the Congressmen sending us those seeds every year? Instead of raising our own as you spoke of we get them right along.

MR. HULSART: Take every body of men like this and have them all think one way and tell the Congressmen. You won't have the seeds any longer. There is not a Congressman down there who wants his political head cut off. It will stop.

QUES. Did any one ever ask them to send them?

MR. HULSART: I for one have asked them to keep them at home. Nearly a million dollars annually, twenty-eight carloads of seed of thirty tons each; that amounts to, with the delivery, practically a million dollars, which might be spent for better purposes.

QUES. For good roads?

MR. HULSART: For many things.

Friends, if there are no further questions, I want to thank you for your kind attention. (Applause.)

THE PRESIDENT: I was interested to know, as a visitor to the land show last month (Mr. Hulsart was also there), that the State of New Jersey appropriated $10,000 for that purpose, and it was certainly a magnificent show of vegetables.

He spoke of how necessary it is for a train to be on time. I know of a man who was riding in a trolley car down in New Jersey and he asked the conductor how soon he would arrive at the next town. The conductor told him, and he said, "Can't you get there sooner?" The conductor said "Yes, but I can't leave my car." He said he had to stick by that.

Is Mr. Kelsey in the hall? If he is I think he wants to say a word in regard to asparagus.

MR. KELSEY: Mr. Chairman, Ladies and Gentlemen: Seven or eight years ago there was an organization in eastern Massachusetts,— a big association called "Asparagus Growers." As soon as I heard of it I joined it, for the reason of being one of them. As time went on the business waned in that State, the enterprise was ebbing, and discouragement was real. I made an effort to organize a little State Asparagus Growers' Association for Connecticut. Now it so happened that of the thirty or forty who joined hardly any of them are specialists. Most of the growers carry several kinds of vegetables. So, coupling that with the fact that the National Vegetable Growers' Association is beginning to call for a State organization for the New England States, for co-operative purposes, it has seemed to us, executive officers of the Connecticut Asparagus Growers' AssocitIn a wise thing to merge out into a larger body, to embrace at least the State vegetable growers. So this is a form of announcement. We will endeavor to organize in that way the latter part of February, which is the time of our meeting. The Executive Committee recognize that the members are largely what you might call market gardeners, that they are closely associated at the present time with similar organizations, and seeing that they feel the stimulus and co-operative effect of these organizations do not feel the necessity for reaching out and forming a vegetable growers' association. Perhaps some people will think we are getting too many organizations, but we believe if we can get in touch with each other through such an organization it will be of benefit to all. There are men over the State working along these lines common to us all. We market-gardners in our largest towns have a certain amount of co-operation and we know the vegetable grower farther back would like to do that. We know our interests are common. For instance, we would like to study problems of co-operative buying and of the public marketing of produce, of retail prices, and wagon vending. Take for instance that point of seeds. We never think of buying commercial seeds. We are willing to pay ten times as much to somebody who knows the seeds are all right. The farm vegetable grower needs that. Wouldn't you like, as you drive through your town to market, to know a certain day on which the vegetaable growers will gather, you will find them and the buyers expecting you and ready to do business; wouldn't you like to know that your team will find comfortable quarters for resting instead of being dragged up and down the street with the uncertain vending process. Wouldn't you like to see that vending process controlled? Perhaps by licensing some of those who do not grow, so the common peddler will have to pay a license, because he is not a producer, it would give the farmer the advantage which he should have.

Perhaps some of you heard J. H. Hale answer that question as to what was the greatest enemy of the production of fruit, and he said the retailer. That does not need any explanation for men who have suffered as we all have in the matter of price-cutting. Only an organization can control those things and you and I know it.

I can find only one objection possibly to organizing the vegetable growers of Connecticut, and that is too many organizations. I anticipate that and trust there will not be any such objection raised. I hope that we may have your co-operation and that you will hand in your name and address in time to any of us from the State Board so you will receive a circular. I trust you will send this to your friends and that they will come prepared to talk and discuss, so that we may have a rousing meeting.

So far as diverse organizations are concerned I think this: Here is an arm; it is the continuation of the bony frame of the body. Is that bone to end like a club, or one single bone, or is it better it should have a thumb and fingers? This in the consummate wisdom of providence is the division of organization, which still co-operates for the accomplishment of the work. So let us get one more finger into this business and let us work together. Let us call this Board of Agriculture that is giving us this grand meeting today the thumb of this organization and the Nutmeg State the arm, and the federal government the body.

Thanking you for your attention. (Applause.)

The President: An announcement is to be made by President Beach. If President Beach is in the hall we will all be glad to hear from him. I want to ask him to come to the platform and make the announcement he has to make.

President Beach: The announcement I wish to make is that there will be a meeting of the Advisory Board on Farmers' Institutes at the close of this meeting, in the rooms in the rear.

While I have this opportunity I would like to say just one word to this gathering. I feel rather happy this afternoon by reason of the fact that the trustees have selected the director for the Storrs Station, having made this selection by reason of the resignation of Mr. Clinton. The Board have chosen Dr. E. H. Jenkins as director for the Storrs Station. I think the college and the farmers of the State are to be congratulated by reason of this selection.

I was interested in what the speaker of the morning had to say regarding the agricultural extension work, because I feel this to be a line of development here in Connecticut as elsewhere. Agricultural education or agricultural development has been going through a sort of evolution for the last twenty-five or fifty years. The foundation has been laid, but I think the real development is to come in the immediate future. There have been two lines so far: the experimentation work and the investigation work, with which of, course it was necessary to start. The science of agriculture had to be discovered before it could be practiced. This has been the first development,— the investigation work of our experiment stations,— not only in this State but in other States, and there has been quite a fund of agricultural knowledge gotten together, and this is to be the basis in the future.

The second line of development is of course the development of our agricultural colleges and schools, which have trained a few men in scientific agriculture who are to be the leaders in the development of agriculture in the future. But we have touched only a few spots, we have educated or given information only to a very few people. A very small percentage of the farmers is familiar with the line of development which is to take place. I think this agricultural extension work of which Mr. Brodie spoke this morning is most important. It is to be demonstration work largely. It is to be instruction for the actual tillers of the soil, not so much by means of institute work and by bulletins, but by demonstrating on the farms of the State.

We are interested in this work at the college, because the work to be done by the Department of Agriculture is to be done in co-operation with the college, as in the case of other States. The advisers are to be appointed, after consultation with the trustees of the college, by the Department of Agriculture. We are interested in this work, and we are asking this year for an appropriation from the Legislature,— an appropriation to carry on what we call extension work. We are asking for this appropriation so we can co-operate in the manner in which Mr. Brodie suggested. He did not go into details, but the plan is this: The Bureau of Farm Management of the Department of Agriculture at Washington are willing to co-operate with the college and are willing to pay part of the expense for this demonstration work. For instance, if we appoint a State adviser they are willing to pay half the expense. Then they are willing to pay $1,200 toward the salary of an adviser, one in each county of the State, provided the college or county meets expense of traveling and the additional salary, if any.

So this line of work of the advisers is to be largely demonstration work. But they are to interest themselves in any line of agricultural activity, to take part in institutes if necessary, to attend Grange meetings and agricultural meetings, to assist at fairs, to help individual farmers, to give them advice regarding the drainage of land, the trimming of orchards or spraying, or any subject which any one farmer may be interested in.

So I feel this is a line of development which agriculture is going to take. To convey the knowledge which we now have, through the few trained men whom we have, to the actual working farmer, we are asking for a small appropriation from the State (about $10,000 a year), which I hope we shall be able to get from the Legislature.

I thank you for this opportunity of saying just a word about this work. (Applause.)

THE PRESIDENT: The hour is not late, and there is one man in this audience who, I am afraid, will not be here tomorrow. He has honored us by locating among us. He was Dean of the Wisconsin Agricultural College for many years, and is setting an example to the farmers of our State in fruit growing. I want to ask Dean Henry if he will kindly come to the platform and say a few words. (Applause.)

DEAN HENRY: Ladies and Gentlemen: I came to this meeting as a listener and with no intention of speaking. My days for this kind of work are over, and these are happy days to me, because all day long I am out on the farm. I am up every morning around half-past five or six, eat an early breakfast, and am out in the field with the men doing what I please almost every day in the week. I go away to New York or Boston, or farther away now and then; I shall probably start for the Panama Canal in three weeks' time. I go where I please and do as I please, but I am happiest on the farm.

When President Beach stood up before you a few minutes ago I remembered when Professor Phelps (also in this room at this time) wrote to me and wanted me to send some man to Connecticut to help in dairying. I called young Beach into my office and said, "There are chances in two States; each State wants a man three months; one State pays $50 a month and one $100; if I were you I would take the fifty-dollar job." He never said, "I am a married man, and don't you think the extra $50 would be a good thing?" In fact I think I really told him that I thought Connecticut had the larger opportunity. The other was one of the big Western States. He came, and I have watched his career from the fifty-dollar job to now, and I am sure if you stand by him and support him you will be as proud of him as I am. (Applause.)

My son and I concluded about the fall of 1904 to purchase land in Connecticut for fruit growing. My son is my only child, and I was willing he should take any kind of education he wanted. He chose agriculture, and of that he chose fruit growing.

My line was animal husbandry, with dairying as a leader, for my State, Wisconsin, has had plenty of boys who have made themselves famous along this line. You heard today of Dr. Babcock's milk test (he was the third chemist I put to work trying to find a quick way of testing milk); you heard of the King system of ventilation (that was by our Professor King); you heard of the caseine test of Dr. Ward.

Now in Wisconsin we early learned that we must work together and along natural lines. Wisconsin today is going forward in every direction with tremendous strides, quite largely because of the State University, backed up by a unity of spirit all over the State. For instance this State (Connecticut) has just gone four million dollars in debt. Wisconsin is building a seven-million-dollar capitol and is paying every dollar as she goes along. She supports ten enormous normal schools, eight or nine county agricultural schools, the State paying two-thirds of the cost; over thirty county training schools for teachers, and ten normal schools, largely for the development of the city teachers. The last Legislature of Wisconsin gave the State Board of Forestry over $200,000, and another one of the State Boards received $3,600,000. We are a people with small farms,— people who all work with our hands on our own farms; we are not landlords and tenants. Now education has done this very largely, and also unity of effort, and today we are going forward faster than ever, and we are paying all our debts as we go.

I hope, Mr. President, I have not come to a State that is going to run behind every year. We are willing to pay our debts. Our taxes are not heavy, and we will gladly pay more taxes if we can have all the privileges that should go with them.

I want to say we are delighted with what we have found since 1904. We began planting in 1905; the first trees were set out in 1905. In 1908 we took the first fruit, and each year the crop has grown heavier. The soil of Connecticut is not rich soil; it is useless to say so, but it is a soil that will give you good service if you care for and feed it and handle it right. I was so glad Mr. Hulsart spoke as he did about rotation and the legumes. He spoke of crimson clover.

Now we gave the New Haven Railroad two trainloads of freight this year in what we shipped in the way of fertilizer, baskets, limestone, etc., and tile; and then in peaches and other things shipped out we loaded enough freight cars to make two trainloads for that road. We have given the New Haven Railroad and our friends when they have come to the farm hundreds of dollars for passenger fares. We have paid it large sums of money for the freight shipped and we have paid our trolley fares. I wish to say that the land that did this, previous to our taking hold of it, to the best of my knowledge and belief, did not give the New Haven Railroad half a freight car of freight per year; and the same land is only partly developed, many of the trees not bearing, yet it has caused that road to have two trainloads of freight. Now if there is anybody here from the railroad side I hope he will think of this. I think that is understood in railroading here, and I know it is going to develop this thing. We now have Mr. Seeley to help us, the industrial agent of that road, and he has been to our farm inside of three weeks talking over the matter. The New Haven road is with us.

I wish, Mr. President, to diverge a little further. I wish I had everybody in Connecticut, and in New England for that matter, with me. Now see if I am not right. Once in Wisconsin I was foolish enough to take some stock in an independent telephone company. It was argued that if we could get two telephones in the town we could get cheaper rates. I put some hard-earned money into that and it stayed there for about twelve years. I had the pleasure of having two telephones on my desk, and, being a nervous man, I always picked up the wrong telephone when the bell rang. I soon came to see that the telephone line is a natural monopoly, and we want but one set of telephones in the whole United States.

We read of the terrible hardship New England will suffer if we are not going to have a competing line of railroad. Who is going to pay for it? Take it in Wallingford, are we going to have two freight offices in Wallingford, two rights of way through the town, in order to have competition? Who is going to build that road? They will bond it, but who pays the interest? We have got to help pay that. But we will have lower rates it is said. How can we have lower rates and support two railroad systems? Would you shut the Grand Trunk Railroad out of New England then? Not at all. I would do what it was proposed to do in the last instance, if it is necessary: let them build tracks side by side, going in and out of Boston and Providence as they do now out of New London. Let them run over each other's tracks, or whatever is best, or build jointly. Suppose they do build into Providence or Boston separately, or force the Grand Trunk to build in there. Is it going to help me,— the New Haven road having to fight it? Will it cut the rates when something is shipped from Canada and it is necessary to transfer the freight to get it to me at Wallingford? My friends, let us be sensible. I want to say in shipping over the New Haven road these trainloads of freight we have had good service, and I believe it has been reasonable in price. The New Haven road has never given me any favor that I know of,— any special favor that it would not give any other shipper. It generally treats us right. It has not treated us right in some cases; its rates are not right for hauling limestone and manure. It has promised to reduce its rates, and I believe it will. But I say let us look at the New Haven Railroad as we should look at it. Now I have traveled on railroads in every State of this Union. I have traveled on the railroads of Western Europe. I have been in Jacksonville and Seattle, in Portland and El Paso,— all over the country. In Wisconsin I have had dealing, naturally, with the railroads, through my college. The New Haven Railroad has treated us splendidly every year. It called a meeting and asked the peach growers to come and talk about how many peaches they would ship, how the cars should be fitted up, and the time schedule. In all cases it has given us good service, and I believe the prices have been reasonable. When we have gone to its office they have listened to us kindly,—Vice-President Campbell and the general freight agent.

There has been a lot of scolding and fault-finding, but I do not go into a hardware store at Wallingford and find fault with the hardware; the merchant is doing the best he can to help us in what we need, and we found the railroad equally helpful. Our farm would not be worth a cent today without that railroad. We load up a car and seal it at four o'clock in the afternoon and the next morning it is in Boston. We had two cars we sent to New York and they hauled them down around Manhattan Island and over to a refrigerator. We didn't suppose they had gotten anywhere near there when a telephone message came: "Your peaches are in a refrigerator in the middle of Manhattan Island." This is important to us who come from the West and put in hard-earned capital.

We must have better railroad service and just as I don't want to have two lines of telephone I don't want it forced upon me by the people of Boston and Providence so all of us will have to help support two lines of railroad. They say, "Mr. Mellen is a hard man and grinds us." All right, how are you going to control it? We now have in Connecticut, most fortunately, a Public Utilities Commission; we have in Washington a United States Commerce Commission; and by the way, they tried to put a Commerce Court on us and our Congressmen knocked it out; we don't want it. What we want is the Commerce Commission, for we have regular courts to settle the cases when the commission goes wrong. Our Commission at Hartford (just as our Wisconsin Commission is in the capitol at Madison) is watching the public utilities of the State and is adjusting the differences between those utilities and the people. We have got our court, and now if the New Haven Railroad fails to treat us right in the transportation of freight we shall go right to Hartford and make a complaint to the Utilities Commission, and with the Commission to stand between us and the railroads, I am not afraid but what we will get fair treatment. Let us be reasonable about these things. Are we going to build a competing line of railroad into every town in New England (or half the towns)? If we don't what good does it do? I am surprised that we don't think more deeply about it.

A VOICE: Give us a word on the parcels post.

DEAN HENRY: I am so full of that that I don't think it would do to begin. I won't say anything except we have a parcels post that is a pretty good measure. I was in Washington when Parcels-post Day arrived and it was amusing too, going into the offices of those Congressmen and seeing what happened. For instance, I went into Mr. Higgins' office, and he said, "Are you the fellow who started that Parcels-post Letter Day?" I said, "I am." He said, "Confound you, what did you do it for? Why didn't you tell those people in Connecticut I am for parcels post?" He said, "Some of us got 500 letters about it and I am going insane." Senator Pomerene of Ohio got over 2,600 letters. That is what you can do every time if you will all show off at once. Now we have a pretty fair parcels post and we want to stand by it and improve it. According to my idea the United States ought to put the express companies out of business. (Applause.) They are parasites on the railroads. I don't believe in the government's taking over the railroads just yet at least; but I do believe there is no reason for the express companies' hiring space in cars of the railroads and then the government's trying to step in and compete without the same railroad privileges. Take the station in New York City; if Uncle Sam does a big parcels-post business where is there going to be room for it? There will be the Adams Express

Company, the United States Express Company, and the United States government. You will have three or four express companies. Shall the government express trucks mix with those of the express companies? We ought never to have express companies. Now that the government is in the express business it must either be a monopoly or we must give it up. I don't think the government is going to give it up. It differs from government ownership of railroads. The government can easily buy up the express companies, giving them what they are worth, taking over all of their property and using all of it. That is a simple proposition.

And, by the way, there is a man down in Washington who has studied this thing from top to bottom. At eighteen years of age he was working in a coal mine, and at the noon hour, when resting, with a torch he was trying to study problems,— problems of long division. Today he is still studying problems, but different ones. His name is David J. Lewis. He has been studying transportation for twenty years as a side issue, and he says the government will never handle the parcels post properly until it has the the whole express business. That is what we want to work for now.

Now we talk about putting on so many pounds of acid phosphate and we figure whether that will grow the crop or not. When we figure out the amount of food we give our cows we do not give them just enough to produce six quarts of milk that day or the next day. Now let us quit this shallow farming. Let us build up our soil; let us build that up and make it strong. The basis of progress in farming in Connecticut is liming the land. The first thing is limestone, the next is phosphoric acid. And if we put on lime first and then put on clover seed that will follow we will grow great crops of clover, and in many cases alfalfa. I won't talk about that now, but, remember, when I say clover for dairymen it means alfalfa. I am trying to talk on broader lines.

Now when I say lime you can put on oyster shells, ground lime, or ashes. But the best of all is ground oyster shells or ground limestone, and of course we have got to use a good quantity of limestone. We have found where we put on lime in any form, with some potash, we can get very large crops of clover, — as large crops of clover as we grow in Wisconsin where land for general farming purposes is valued at $100 to $150 per acre. Now with that clover and the limestone, if we put on phosphoric acid and potash, we shall have a wonderfully generous soil. How the trees will bear! I have an amateur grape vineyard of about three-hundred vines. We grew these grapes simply for giving away to friends and for experimentation, but they were so abundant that I sold nearly $50 worth of grapes. I sold grapes for $1.50 for a single vine. I got $1.50 a vine from several vines for grapes we didn't care to use for any purpose. We have had peach trees yield three, four, five, six, or seven bushels. They say peach trees die in Connecticut, but we have had three or four crops from those planted in 1905 and they are covered with buds this year. We find corn does well here and clover does well.

I have owned land in Wisconsin and California and I want to say to you that we find this Connecticut soil is all we can ask for if we treat it right, but we do not buy cheap, commercial fertilizers and sprinkle on a little gingerly and then expect a big crop. Mr. Daniels is here, and I think he will bear me out; he saw two tons of clover vetch hay right on the ground in July in the orchard. Somebody said, "Why don't you cut it? It is worth $15 a ton." We said, "It is worth more than that right where it is." Now the New Englander is a crafty fellow; he will plant an apple orchard and put in Timothy hay, then cut the hay and go out to see where the apples are.

If you will just lime your land, put on phosphate and clover seed and plow the clover under (just put on lime on perhaps ten acres) you will see the results you will get. In one place we have clover sown among the corn. We put on a carload of ground lime and phosphate (500 pounds of phosphate), and we turned it all over this fall. That is the beginning of the building up of this field.

Now next month Dr. S. G. Hopkins will be in Hartford. I consider Dr. Hopkins one of the most remarkable men in America. He is fighting his battle almost alone, and that is that you must build up the soil with lime, refuse, and phosphorus. You must make your soil strong and keep it full of humus. He is practicing what he preaches on a three-or-four-hundred-acre farm in southern Illinois. He wrote the other day that he had put forty carloads of ground limestone on the farm up to this time, and in his last letter he said he was unloading the eighteenth carload this year. A single crop had paid for all this and the cost price of the land. You can build this Connecticut soil up, and if you treat it right you can make it give in one crop what it costs. Now don't claim your soil is rich; take the other side, claim that it is genial, that you can build it up. We have been here since 1900. We bought our land in 1904 and planted in 1905. We have never been discouraged. We have had that land yield from two or three hundred to a thousand dollars an acre for small quantities,—land which was not producing anything, where the fences were down, and which was not even used for pasture, having ceder trees upon it large enough for fence posts. Two, three, four, five, and six hundred dollars is common for many acres.

There are many other things, not only peaches, that you can grow here today, young men. There are a good many young men in this audience, and I say to you young men, don't think of going West. I say this after having lived there. I had a lemon orchard in California. I have lived in Colorado. I did my life's work in Wisconsin and vote there. I pay my personal taxes there. They made my taxes three times what they were. I am going to keep my vote there, and I will have to pay the income tax. I could skip that by coming to Connecticut. By our method of taxation that is the way we get money,— by taking it out of the men who have got it instead of the men who are poor. (Applause.) I pay three times the taxes I did before the income tax was laid, and know of a man who pays thirty times the tax he paid before; but at the same time I know that Johnny Myers, living down the street and owning a little house, won't pay quite as much, and that is all right. We won't have all these good things if the rich won't pay their share.

Now let us stand by the New Haven Railroad. Let us say that property in a way belongs to us,—those great iron rails and those roadbeds. All that is the foundation of the prosperity of New England, and when it is making mistakes let us go to it as a friend, as a business man should, and talk to those men, and if they won't do right let us handle the matter through the Utilities Commission and the Interstate Commerce Commission; and above all let us elect able men every year who shall give us a good Public Utilities Commission and one that the railroads themselves cannot run. Those men will stand between us and the railroads. And if we have any grievance with the New England railroads let us go to the Interstate Commerce Commission instead of writing petty articles in the New Haven papers. Little bits of namby-pamby articles of fault-finding must annoy those men like mosquito bites. Think of the responsibility those men have to carry. It is good service, not poor service, that we receive from the railroads of the country, and if we become more familiar with the matter we will consider it a shame to talk about these railroad companies as they are talked about. I don't know Mr. Mellen. I know him as one of the officials of the New Haven Railroad. He has never given me a favor and I don't want one. I do want, in the interest of my own property and the property of my son, to stand by that factor which is vital to us in the time of its need, and now is the time it wants friends.

Thank you. (Applause.)

This meeting was then adjourned until the evening session at 7.30 o'clock.

FIRST DAY — EVENING SESSION.

Meeting called to order at 8.00 o'clock by Vice-President Wilson H. Lee.

VICE-PRESIDENT LEE: Born and bred in that good old State of Massachusetts, it is with a great deal of pleasure that I see by the program we are to have a man from that State talk to us, — a man from that State (particularly if he gets into the Legislature) who cannot help but interest us. Next to Connecticut it is the greatest State in the Union; and if I were in Massachusetts I might say the same thing. I left there when I was about twenty years old, and I want to say that I have always kept up my correspondence with the old town up in the northern part of Massachusetts, I don't believe there are a dozen farmers among them. You see they are interested in agriculture in that town, but it happens to be a manufacturing town.

Now this gentleman comes from the southern part of the State. He has been a member of the Massachusetts' Legislature, and he is chairman of the Dairy Commission in Massachusetts at the present time. I know that he has done good work. I have a very close friend there, and I have heard that friend speak in the very highest terms of him. The subject that he will speak upon this evening is one that interests us all. It interested me about eleven years ago when I went out five miles into the country. We had four district schools in the town and we consolidated them and built a $20,000 schoolhouse; now we have as fine a graded school as there is in the city of New Haven. That is rural progress. We have electric lights out there. That is rural progress. When I went out there we had no telephones in that section; now everyone, practically, in the neighborhood has a telephone. More rural progress. Since I went there city water comes into the town. Now all that we are waiting for is for President Mellen to build us a new station, and then we think that the rural progress will be quite well started in our town.

Another pleasant thing that I learned about Mr. Gardner,—and it gives me more confidence than ever in the man, is the fact that he happens to be a printer. If there is any man who looks good to me, aside from a farmer, it is a printer. They are always safe men to tie to.

Now I take great pleasure at this time in introducing the Honorable C. M. Gardner, Master of the State Grange of Massachusetts. He asked me to leave the Honorable off, but, as he is entitled to it, I have given it. (Applause.)

HON. CHARLES M. GARDNER: Mr. Chairman and Friends of Connecticut: I sincerely wish that I had a voice tonight to bring you forcibly the message that I want to bring. I have had none at all for the last three or four days, but with your co-operation I think perhaps we will get on very well for a little time together. I wish I had a voice, because I want to bring, if I can, a very earnest message from the State Board of Agriculture of Massachusetts, of which I am a member, to you, the representatives and friends of the State Board of Agriculture of the State of Connecticut; and that message is contained in the topic assigned for the evening, "The Rural Progress That's Real."

This is an age when we are called upon in all lines of activity to distinguish between the real and the sham; and sometimes there is more or less difficulty in making that distinction. Perhaps the most talked-about theme in certain channels at the present time and for the past decade has been the theme which we denominate "Rural Progress." Never has there been a time like the past ten years when so many columns of the newspapers and so many pages of the magazines have been devoted to the discussion of the problems, the needs, and the possibilities of rural life; and that very fact is in itself significant. Never was there a time before when so many conferences have been held to discuss matters of rural life; never until comparatively recent times has it seemed necessary to appoint country-life commissions; and never, perhaps we may say, as in the last ten years, has there been such a disposition on the part of so many people to talk about country life, its problems, its needs, and its possibilities; and out of it all has grown a very general topic, which a great many people are talking about who know very little about it; which a great many people are free to give advice upon, because it offers a fruitful field and because it is a theme that affords possibilities for generalities in statement like almost no other. That is why they have inculcated the subject of rural progress that is so prominently and conspicuously before public attention in every State, in all parts of our country; and a great many people whom we would be surprised at being so interested are interested and are taking an active part in inculcating and agitating the subject of rural progress.

I think, perhaps, however, we make the greatest mistake of any in thinking, discussing, and agitating rural progress as something that is yet to be. As a general thing those who discuss the problem of agriculture and the farm and the country town do so upon the assumption that all those rural interests are tremendously in need of agitation and education. I think perhaps at the very outset they tend to misrepresent and to overdarken the rural situation as a basis for their discussion and as the groundwork on which they propose to meet and solve those problems; and so I am going to take a little different viewpoint tonight than perhaps you would expect,— a little different viewpoint than most of those conferences and agitations have taken and do take; and perhaps I shall say some things or advance some propositions with which you will not agree. I shall endeavor to do that very thing, too, because out of such a disagreement comes our largest benefit; and I am sure these annual meetings of the State Board of Agriculture, whether in your State or in mine, are valuable in just so far as they set us to thinking a little further ahead than we had thought before; and so my viewpoint of this question of rural progress that's real will be that the rural progress which is real is not that which is yet to come, nor that which is to come as the result of all these agitations and discussions and commissions and conferences; is not that which is the result of all these discussions in the newspapers and the magazines and all the earnest investigations of the people, some of whom are very familiar with the topic; but, the rural progress that is real is the rural progress that is here; and along that line I propose to talk to you tonight,— not of the rural progress that is yet to be, but the rural progress that is here and now in our New England States; that I shall speak especially about.

And, first of all, in discussing rural matters we must realize the fundamental truth which has come to the attention of more people in the last ten years than ever before, and which is in itself the greatest assurance of the actual coming of real rural progress, and that is the recognition that the fundamental prosperity of a nation must rest upon the prosperity of the rural community, because the rural community, so far as the needs,— vital needs of the people,— are concerned, is primarily a producing community. I think that has been borne to the attention of the students and the business men of the country and the statesmen in the last ten years as it never was before. I think there has come an awakening in the minds of men who had never thought along those lines previously, and the business men who are concerned with handling large affairs and who are responsible for great transactions in the financial and public avenues of natural life have awakened in recent times to the fact that unless the rural community is prosperous and that unless agriculture is profitable there can be not only no rural progress but no abiding natural progress; and if we had accomplished nothing else that was helpful for the rural community in the last ten or twenty years the fact that we have awakened the attention of the leaders of industry and of public life, as they surely have been awakened, to the fact of the importance of the rural productive life, shows we have really accomplished genuine rural progress.

You have heard, perhaps, the story of the country merchant, possibly in a Connecticut town,—who was interested to know what the different people of his community thought of the work they were doing; and so, being somewhat of a philosophical Yankee, he put up a blackboard in the rear of his store, and fastened a piece chalk conveniently nearby. He asked the different people who came in to write on that blackboard three things: first, their names; second, their occupations; third, a single sentence which would comprehensively express their view of their business. The doctor came in and wrote his name, physician, and then a single, trite sentence, very explicit, of his business: "I prescribe for all." That was good. The lawyer came in. He looked at what the doctor had written, and wrote, very naturally, after his name, an attorney and "I plead for all." Then the clergyman came in, and of course there was no question what he would write. He wrote his name, clergyman, and "I pray for all." There were three honest expressions from what we term three of the leading professions of modern life. Then one of the farmers of the community came in and he saw what the others had written, and he laughed. He took the chalk in his hand as if to write, then he laughed again more loudly than before, and then he went up and wrote on the blackboard underneath the others, with a firm stroke: name, "John Anderson, farmer; I pay for all." (Laughter.) And somehow he had summed up, it seems to me, in the most concise notion possible, a goodly comparison of occupations, as between those four at least.

Now if it be true that the doctor, the lawyer, the minister, the tradesman, the merchant, the manufacturer, and the representatives of every other occupation in life who lead their own work, who believe it essential to the progress of humanity, who are striving to make their work the best work possible -- if any one of these has in the last ten years advanced a single cog forward toward a realization that rural prosperity (because it is the prosperity of fundamental productiveness),— if he has advanced a single cog, I say, toward a realization of the vital importance of these fundamental producing industries,— then we have advanced by so much in real rural progress.

And I submit to you the second thought: That the only rural progress that is real is and will be for the most part, that which is advanced and promoted by the rural people themselves; not by the importation of advice and suggestion from outside, however valuable and timely that advice and suggestion may be; that real rural progress will be accomplished not by sudden and wonderful enactments, but by steady growth and effort on the part of the rural people themselves. I think the whole trend of some lines of modern rural-progress discussion and effort is made in the wrong direction, at least is founded on the wrong premises, for it attacks the proposition thus: first, rural interests are tremendously in need of all this assistance from outside, and, secondly, it is assumed, at least on the part of many well-meaning people that the assistance that is going to make the rural community prosperous, progressive, and successful is coming from without; whereas I believe it must come and always does come from within.

May I lay down to you a threefold proposition? That the only rural progress that is real and that will be abiding and that will be in any measure to the rural people has got to furnish to the dwellers in country towns three things, and there is absolutely no escaping the truth: first, there has got to be a reasonable compensation for the work that is done in those country towns; second, there has got to be a reasonable degree of comfort and convenience associated with that work; and, third, there has got to be a reasonable promise of improvement. Those are the three things, friends, that ambitious, energetic persons in every walk of life demand,— and the conditions in rural life are not essentially different from those of city life,— fiirst, a reasonable compensation for the work done; second, a reasonable degree of comfort and convenience attending the life that does work; and third, a reasonable promise of improvement year by year.

Now we have had three epochs in rural life extending back scarcely three generations, and we can look back in quite recent history and realize how true it is, (going back perhaps three or four generations ago,) that in most of our country towns in New England, before the day of great cities and large centers and the interlacing trolley lines and means of communication, we found the young men growing up, and for the most part, in the majority of cases at least, settling down on the old homestead or at any rate within a reasonable distance of their birthplace, simply because they had not yet come to a glimpse of the world; they had not come into the attractiveness and its alurements, and their sphere of life was necessarily limited. That was one epoch in the rural life of our New England country. Then we swung to the other extreme; instantly our young people were seized with a desire to get out into all the great avenues of the world which had been borne to their attention, but about which they knew very little, except as places of allurement, and they were drawn away from the country town into the great city. That was the second epoch in the rural life of New England. You and I have lived to see that third, which in a way is distinct from the other two and very much more interesting. Because of it, we see the young men,— a great many of them, a surprisingly great number if we investigate,—who are conscious of that great city, who know of its allurements, who are in close touch with its attractions, who possess the easy means of transportation to get to them, but who still stay, or ultimately go back to country-towns and are using their energies and time on country town acres to develop the industry of agriculture,— three distinct epochs, if you please, in the rural life of many New England country towns.

So I come up to the thought which I would bring to you as earnestly as I can, that the rural progress that is real is here now. And I want to call your attention to some of the essential features of that rural progress that is actually here; and I suggest to you first of all that we find its expression in the rapid advances of education that indicate conservation to the rural communities. Investigate some day when you have an opportunity the millions of dollars expended every year by State and nation for the agricultural colleges and experiment stations conducted under the direction of the different colleges of these United States, and realize that the missions of all these institutions are—what? To minister definitely to the rural community; and they are doing this to a wonderful degree. The directors of our experiment station in Massachusetts told me recently that during the last year they had answered eight thousand letters from farmers in Massachusetts asking for information along some lines of cultivation of their soil. Just think for a moment what that means. It is no extreme case. Supposing of those eight thousand letters only one-half (four thousand) carried back to the inquirers one suggestion that was helpful; then again supposing that only one-fourth of those suggestions,— and that is two thousand,— was ever put to a practical test, and supposing that of that number only one-half amount to anything, or only five hundred, there are five hundred distinct local centers of improvement. And what is true of one State is true probably of other States, and perhaps to a greater degree. Who of you will attempt to tell me what it means when a young man graduates from an agricultural college where he has been taught anew the life of the soil and the possibilities of the rural community and of his work, when he goes back to the old home field on the mountainside, where he tills those acres as they were never tilled before, often in such a way that his father or grandfather hold up their hands in holy horror as they see it. Who shall be able to tell us how far and how far-reaching is the extent of that improvement for a rural community? They are going out,— thousands every year,— from our agricultural colleges in all of the States,— going into these agricultural colleges during the winter, people of all ages, from eighteen to — well, we had a man at Amherst last year who was sixty-five, and I presume that is true in other cases,— going back to the old roots, if you please, to put new life and energy and enthusiasm and ideas. Who shall be able to tell us what that means for distinct, general, rural progress in your State and mine and all others? The meetings of our State Boards, gatherings, and demonstrations before the farmers and rural communities,— demonstrations in all kinds of progressive agricultural work — (there are hundreds and thousands of these held every year in all the States throughout the country) and the agricultural schools,— why who ever heard twenty-five years ago of all the work of agricultural training being so fast introduced into the country through the schools of the States East and West? Dr. Claxton, United States Commissioner of Education, speaking to us in Massachusetts, said that he believed that the policy of the future for the rural communities was to consolidate for just as wide an area as possible and to locate that schoolhouse in a building on a plot of thirty acres, and have the principal of that school a man who should be thoroughly conversant with cultivating those acres, who should be full of good ideas, and develop the experimental work, even half of it, in the course of the rural schools of the New England country towns. Do you suppose a Commissioner of Education of the United States government would ever have made that statement twenty-five years ago? It shows the progress of education, and somehow you and I can think back, because some of you are as old as I am and can think back and be reminiscent just a little and realize that the school curriculums (courses of study) were not just the same twenty-five years ago as now. You can remember when we were taught that a thing was so because the book said so, and that was conclusive; if it wasn't conclusive, the teacher said so, and that settled it. Some of us remember when we tried to prove the contrary, and it wasn't a success. We live in an age of remarkable demonstration. I heard a principal of a normal school give the best condensed summary of educational progress the other day. He said: "Education is no longer something to be taught; education is something that must be caught." I want to give you that thought, because it expresses modern progress in the education of the country school that is worthy of attention: something not merely to be taught, education is something to be caught. And when we go through our school garden work,— when we go through all the lines of agricultural training that are being worked out in the public schools throughout the country, in the agricultural schools that are being established in so many States, and in the summer schools and all those things, we realize that real rural progress in education is not something that is to be, but something that here and now is.

The second thought is in the improved conveniences of the rural homes, where we get a glimpse of rural progress that is. I want to be reminiscent with you a little while. They say it is a sign of age when you begin to want to talk about the things which happened when you were a boy. The last two or three years I have been very much inclined in that direction, and so be sympathetic with me and I will be reminiscent with you. My mind goes back to a little town in Berkshire County, Massachusetts, where I spent most of my boyhood. There is a farm home up there, four miles from any village, railroad, or post office, and I can remember as if it were yesterday (I will not tell you how many years ago it was) when I went up there, a boy of eight or nine years, and lived for a while on my grandfather's farm. I can remember that old homestead, the quaint stone house with its great chimney and wide, open fireplace; I can remember my good Yankee grandfather sitting before the uncertain light of that fireplace on a winter night, holding in one hand a tallow candle and in the other the old Berkshire County *Eagle,* the county paper, and he read down line by line every column of reading matter and advertisements. He always stuck a pin in where he stopped, so as not to lose anything in that paper. (Laughter.) I remember just as though it were yesterday. And I was there not very long ago; the same house, the same country town,— but what a change! The old fireplace had given way in turn to a wood stove, then a coal stove, now a modern heater in the basement; the old well water,—always a menace to health,— has been replaced with a fine system of running water from the hillside; there is a good, modern bathroom and all up-to-date plumbing in the house; the old fences have been removed, the walks and driveways have been cleared, the house newly painted; everything about it is enterprising and up-to-date; the same old farm home but all these changes have taken place. There is a telephone inside. My old grandfather I presume never went as far away from home as Boston ; perhaps he might have gone to Springfield, Hartford, or Worcester. I wonder what he would have said if he had been told that in scarcely more than a generation he could stand in one of the rooms of his own house and talk with Chicago or with Boston as readily as he formerly talked with a neighbor who drove up and chatted before the door. The rural mail carrier comes along. Why in those old days we used to go to the post office Friday nights, because the Berkshire County *Eagle* came Friday nights; there wasn't much to go for in between ; we used to go on snowshoes many times, because it was difficult to go through the snowdrifts on the public highway. Today the rural mail carrier comes at nine o'clock every morning. What does he bring? Why, not merely the Berkshire County *Eagle,* not merely the Springfield papers; he brings papers from Boston if you want them, he brings the news of the world, all the latest magazines; in the largest city you can scarcely have more of the world's news brought before you every twenty-four hours than the dweller in that lonesome square house in Berkshire County on the hillside. Do you realize what the mail carrier means for real rural progress? I presume some of you who are the beneficiaries of the rural-delivery routes have never realized what the rural free delivery means. A mail carrier in our State told me that eighteen months ago he started a new rural route of twenty-two miles a day. He said, "When I started on that route in the first few weeks I left two daily newspapers,"—now just mark, a twenty-two-mile route started only eighteen months,—he said, "I left two daily newspapers the first few weeks I carried the mail on that route; today, with the same number of houses, and practically the same people, I am leaving fifty-four daily newspapers every morning." Do you catch the significance of that fact, for there are more than 43,000 rural free-delivery routes in this country. That one was typical. Perhaps that proportion would not hold with them all, but in a large measure it is suggestive of the spread of intelligence in rural communities that has been brought about by the free delivery of mail to the farm homes. Now I don't care what newspaper you read, even though it be the New York *Journal,* or any other that you can name; if you read that paper intelligently and discriminatingly you get some benefit out of it. I know no one thinks for one minute that on the farm-home tables of this country is to be found the trashy, cheap, valueless literature. It has been my privilege in the past few years to stop at a good many farm homes in Massachusetts and other States, and in a good many hundred farm homes I want to tell you I saw on those tables the best magazines, and for the most part a good, daily newspaper — clean and wholesome literature,— and the rural free-mail delivery is responsible for probably seventy-five or eighty per cent of it. And so along the lines of conveniences, as I recall those old farm homes, you remember them, and you realize as well as I the changes that have taken place in the comforts and conveniences of country homes in the last twenty-five years. We had a topic in our Granges in Massachusetts — if you will pardon references, because I see the faces of Grange people before me,—we had a topic in our Granges a few years ago in Massachusetts: "*Resolved,*—that in the Massachusetts farm home a bath tub is a greater means of culture than a piano." It was a good topic; a greater means of culture,— yes, continuing culture. Why? Because the use of that bath tub suggested a more cleanly, wholesome personal life; a group of those more wholesome, cleanly personal lives means more wholesome, cleanly families, and a group of those families means more cleanly, wholesome communities; and all over our country, in New England especially, the percentage of improvements in farm-home conditions in the last twenty years has been wonderful.

I stayed a while ago with a man who lived fourteen miles from any railroad, away out on the hills. Going home late at night, I thought I would be helpful; as we got up to the barn I said, "Can I hold the lantern for you while you put up your horses?" He said, "No, it isn't necessary," and he touched a button right in front of his barn and the whole building was lighted by electricity. Away up on the mountainside was a little waterfall, and he, in his forethought and enterprise, had utilized it and built a dam and was generating electricity and lighting his home, his barn, and his other farm buildings.

I speak about this proposition, because I believe it is true that there has been no other spot in New England in the last twenty-five years where the percentage of home improvement has realized the cleanly, wholesome, practical influence of improvement,— no other place in New England where the percentage has been greater in the last twenty or twenty-five years than it has in the rural homes of your New England State and mine. That is rural progress that is real, and the kind that makes rural communities better.

The next thought is the expression of rural progress that is found in rural organization. I don't need to speak about the Grange, which is as strong your State as in ours, touching the life of the country communities, making for all things that are wholesome and uplifting all through the country, in thirty organized States. Referring to similar things, I speak about the coming in rural communities of the new organization that has been tremendously beneficial and uplifting; I speak of the men's club, in many cases organized under church auspices, bringing together the people of different churches, and perhaps of no church relation, in a local community. There are hundreds of these men's clubs scattered all over our country communities that were not here ten, fifteen, or twenty years ago; all the various civic associations, village improvement societies, cow-testing associations or organizations for the promotion of efficiency right before you,— these prizes are an illustration of the movement that is doing so much to increase the efficient growth of that great staple crop, corn. The progress and the development of rural organizations in the last fifteen or twenty years, the tendency of rural communities to get together in an organized form to do collectively what they could not do as individuals, have been some of the signs not of rural progress that is to be in your community and mine, but of rural progress that is, right now, because premeditated and organized by the country people themselves for themselves,— the federation of rural forces for the best progress of the rural communities.

Look back with me again and tell me what has been in the years past the greatest menace to the progress of a country town: the lack of a willingness to pull together and a tendency, too often present in too many rural communities, to line up against each other on matters important or otherwise when there was necessity for a line-up together. How long does it take you to go into some rural communities and find out the whole history of the past half century; how long does it take you to find out which families don't speak to some other families; to find out the different feuds that have existed back during the years? What caused them? Some trifling matter; it might have been a bitter quarrel; it might have been a love affair; it might have been a business deal. Never mind what it was. Over and over again down through the years small communities whose only salvation lay in pulling together if any kind of progress was expected have been pulling absolutely against each other. What has happened? Over here was a little village, down here another, there another, and over there another, — four or five communities. When this one wanted a new schoolhouse the other three would get together and defeat it. Next year this village wanted something, but the other three were right on hand, and so that has gone on in far too many rural communities. I speak plainly, but you know that it is true,— in far too many communities so small that their only hope was to pull together there has been absolutely a lack of that cohesiveness which made the progress of that community possible.

Friends, there has been a tremendous change in a great many rural communities. The Grange has been responsible in a large measure in some localities; in some the earnest, energetic, enterprising country church has been responsible; in other communities education along those progressive lines practically has been responsible; in other sections good, sound, common sense that underlies the rural progress that is real has been responsible. Pardon the Grange reference. We organized a Grange out in the middle part of our State a while ago, and they said, "You will have trouble there; there is one church which has been the church of the town for many years, and they will oppose the coming of any new organization like the Grange." We organized it, and after the officers were installed and the work of the evening was about to begin the secretary arose and said, "I have a communication that I want to read,"—the first communication ever read in that Grange, and I want to say to you it was the most significant communication I ever heard read at any Grange in a great many years of observation. It was a letter from the president and secretary of the men's club of that one church in the community, and this was it,— catch the significance: "We, the members of the Men's Club of the Congregational Church, send greetings to the new Grange. We welcome you as a new force in our community to promote good things. We pledge our best efforts to work with you even as we invite you to work with us for the good of us all. Signed by the secretary and president." I submit to you that there is the keynote of rural progress, when you can get the different organizations of any rural community representing their diverse lines of interest and power to get onto that platform: "We welcome you to work with us even as we pledge ourselves to work with you for the good of us all." Thus every country-life commission can just pass that town by when it goes out to do its work, because that community has struck the real keynote of it all, and the community will work out its own rural progress for the future.

I would like to talk to you just a little more along that line, but perhaps I can sum it all up by an incident. When going through the grounds of an insane asylum several years ago over the great farm,—one of those massive institutions with a superintendent of the farm,— looking out over the field I saw a group of male patients (ten or twelve,—big, lusty fellows every one of them) in charge of a single attendant,— a little, frail fellow who wouldn't weigh a hundred pounds. I looked at them a while, and finally I said to the superintendent, "Don't you think it is risky allowing all of those patients,— big fellows, and crazy I suppose, in the care of that one little attendant? Supposing one of those would attack his keeper and the others would join in, why they could throw that little fellow over the fence, they could kill him; all sorts of things could happen." He looked at me in a sort of pitying fashion; he said, "Well, that shows how much you know about insane people; that thing won't happen; it is my experience that if one of those insane people would attack his keeper the others wouldn't help. But if we should see the second or third come to the assistance of the first we should have to say there was some chance for their mental recovery." And then he dropped me this significant thought, and I give the matter over to you; he said, "Young man, co-operation is always a sign of sanity." And I am not sure but what it is as true outside of insane asylums as in; and I leave it with this State Board of Agriculture: "co-operation is always a sign of sanity." And we find one of the best evidences of rural progress of today that really is here and now in the fact that rural communities are going into rural organizations and then are getting those rural organizations together for the good of the community as a whole. "We welcome you to work with us even as we pledge ourselves to work with you for the good of all of us," —the most helpful sign of rural progress in many a community.

I would like to show if there were time a thought of what has been accomplished in the last few years in legislation for rural progress. I know that sometimes when one has been in the Legislature there is perhaps too much stress put upon matters with which he has been familiar, and he sometimes refers to those bills; but I remember when I was on a committee of agriculture in our Statehouse a man came to our committee in advocacy of a certain measure and made this statement; I never forgot it; he said, "Gentlemen of the committee, it is time that Massachusetts did something for the farmers, because up to the present time agriculture in Massachusetts has been nothing but an object of charity." Those words went deep into my thoughts, for it seemed to me that, if it were true, the organizations that were dedicated to the upbuilding of agriculture and rural progress had been tremendously slack in their work; if it were not true the fact ought to be known; agriculture an object of charity! And so I went to the records and found that during the last year in our little commonwealth of Massachusetts there had been expended more than a million dollars for the good, distinctly, of agriculture, rural towns, and things that are in rural towns of our commonwealth. Where does the money go? It goes into the work of my State Board in all its departments, goes into the work of the college, the agricultural fairs, goes into the country schools; longer terms: State aid, for better teachers, supervision of garden experts; it goes into country-town roads, across the bottom, clear on west,—a million dollars of a total of about fourteen million in our commonwealth that is devoted to the improvement of the rural town and the promotion of agricultural efficiency in our little commonwealth at the north.

Look at it yourselves sometime, friends of Connecticut, right along that line, and take the different appropriations of your commonwealth, as your Legislature will assemble now in two weeks to do its work; look at the different appropriations that can be traced distinctly toward those channels that make for the benefit of the rural town, not merely agriculture, but the country schools and the country roads and everything that shall indicate the rural progress that is today, 1912, tomorrow, 1913. I think we ought to do this in justice when we go before our lawmaking bodies year after year. I am not saying that agriculture has had its full share, because it has not, but admitting that it is true that it has had something, and with the only object of what is being done by statute or legislation and appropriation for the real rural progress of today, and along so many lines. I wish there was time to indicate much if not all that has been done in your State and mine for the improvement of conditions in the country town, for more schools in country towns, for work along college and experiment stations as now transacted, and in so many directions; this has been possible with appropriations in the last ten years in your State and in my State. It would perhaps have been sneered out of the Statehouse fifty years ago because it was for the country town or rural interests. I believe that our lawmakers are awakening more and more, slowly perhaps, to the fundamental importance of those attractive country towns; and, friends, I cannot help feeling tremendously encouraged along the line of legislation and of appropriations for the rural interests of today and of tomorrow.

Just one more thought, and somehow, to me at least, it is more vital in the expression of the rural progress that is real than any other one thing; it seems to me from observation that there has come over us all a greater sense of loyalty to the country town in the last few years than ever before. There was a time when a great many farmers appeared to be at least ashamed of their work; when they were heard expressing a wish to get out of it and they were constantly heard expressing a wish that their sons would not follow in their footsteps. Things have changed remendously within the recollection which dates back only ten years, in your recollection and mine. The city people have drifted back toward the country; business men, hard-headed, practical and earnest, who in the midst of the competition of modern life have been able to accumulate large fortunes are coming back to some hill town, some little country hamlet; there they are buying farms and engaging in extensive cultivation; they are giving us an object lesson in what can be done by agricultural efficiency applied in conjunction with modern business methods, and are showing also the readiness of capital to invest in agricultural operations. And I believe the next ten years are going to show this to an amazing degree. And what does it all indicate? A growing respect of people away from the farm for the farm,—a growing pride; it ought to be so at least—growing pride in the people on the farm for the farm, people in the country town for that country town. I always think when I look into an audience in which there are a great many men that I would like to ask them three questions, if I knew them well enough so I really dared. I would like to ask the audience tonight three questions, just to see what your answers would be. First, what town do you live in? The best town in the world. Second, what job have you got? The best job in the world. Third, who is your wife? The best woman in the world. If you don't live in the best town in the world let's get out of it; if you haven't got the best job in the world let's get another; if you are not sure you have got the best wife in the world— (laughter) —well, if you are not sure you have got the best wife in the world, get better acquainted with her, then you will know it is true. (Laughter.) Friends, there is a lot of good, hard sense in the thought, I believe, that in no one direction has there ever been greater progress for rural progress that is real made than in the last ten years. When was the naming of country places in the rural towns of New England? When was the adoption of stationery for the farm home and business? When was the marking of the products that went out from the farm, with its name perhaps—a distinctive trade-mark. When did all these things come but in recent years, and with them has come an element of pride. The minute a man gives his place a name, the minute he puts that name on printed stationery and uses it in his correspondence, and the minute he begins to mark his products and send them out in that name and under that trade-mark he has injected into his business as a farmer a certain element of pride that is one of the greatest assets that he can have. These are all evidences of this progressive, forward movement that indicates the pride of the farmers in the farm, of the rural residents in the country towns. I say with all the assurance of confidence that that real rural progress most to be desired is actually here now, splendidly at work for development in the future; and so I close with just a thought as at the beginning: with all the investigations, with all the discussions, with all the measures, with all the conferences,— helpful though they may be in directing along channels that are extraordinary, instructive, and beneficial,—we welcome the mall; still when you get right down to the rock bottom of the case the only rural progress that is real and that will be abiding is the kind that the rural people work out for themselves, by themselves, and by uniting themselves, by recognition of the fact that God has placed them in a home made beautiful by surroundings and with all the possibilities of development both by living and by industry, and second to no other thing in all this universe which the Creator has created; and they have seen the signs of the times more and more, men and women who were born away from the farm, men and women whose whole activities and effort and life have been away from agriculture; men and women who have been exerting themselves in exactly opposite directions from rural progress are beginning to think toward those things and beginning the thought with an interest and with an enthusiasm and with a purpose; and we welcome that thought in them, which shall be termed not rural progress, but as an adjunct to and a helper of a united, earnest, sincere effort to raise the residents of the country towns who must work out through themselves, for themselves the only rural progress that is real. And somehow I believe in the large mission of every State Board of Agriculture and its associated departments, of every Grange, country church, men's club, every home, and of every individual in the recognition of rural progress,—not of something we have to hunger for and work for and not get, but as real rural progress that is,— something well begun here and now in education, in conveniences in country homes, in rural organizations, in the federating of rural organizations, in legislation for the good of the country towns, and in that fine loyalty that first of all inspires us with a love of the home, and then that recognized purpose to make those efforts the highest, the largest, and the most enduring that it is possible for us to accomplish; and, friends, with everything else cast off and with every thought for the moment eliminated, with rural progress worked out by the rural people themselves, along those lines that are practical and commonplace, and through those channels that are possible, it certainly seems to me we ought to have rural progress that is real. (Applause.)

The Chairman: How true it is that the farmer is taking a pride in his vocation; and even the young people are proud that their fathers or their brothers are farmers. I noticed the other day that a young lady was sent from a Southern State to a New York fashionable boarding school, and when she arrived there she was asked what her father's business was. As he was an undertaker, she felt she would lose caste if she told the truth, so she said he was a Southern planter. (Laughter.) And even the children take pride.

The name of the next speaker does not appear on the program, and I am reminded of last spring (I think it was a day or two after Memorial Day) when I was down through my barns. I have a watchman there, rather a slow-thinking man, and I saw he was in deep thought. I said to him, "Simon, what are you thinking about?" He evidently had noticed that I hadn't had a uniform on and appeared in the Grand Army parade the day before. He said, "I was wondering if you escaped the draft in the Civil War." (Laughter.) I told him that I didn't consider that very much of a compliment, but if I had been old enough I probably would not have had to stand a draft. There is a gentleman here tonight, however, who did have to stand the draft; he did not enlist, but he was drafted as a speaker.

Now many of the things that have been told us tonight about rural progress in New England such men as the gentleman I shall introduce to you have had a large part in creating; and I think I speak truthfully when I say that he, as the head of the Agricultural Experiment Station of Connecticut, is the leader in his class; he is the king. He has done much for agriculture; he has protected us on the outside from the bugs and the insects, and our stomachs from the poisons that are contained in the food. No meeting of the State Board of Agriculture would be complete without a word from Director E. H. Jenkins, whom I take pleasure in presenting to you. (Applause.)

E. H. JENKINS: Mr. Chairman, Ladies and Gentlemen: For the sake of economy of your time, at the expense of my own, I have committed to writing the very little that I have to say this evening.

As the Board has given me no particular subject for my talk, I shall speak for a few minutes about the special things which just now chiefly engage my own attention, viz: "The relation of the agricultural college and the two stations, and also their relation to the present and prospective agricultural movement in this State. My reason or excuse for this may be found in the fact that the Board of Trustees of our agricultural college and the Board of Control of the New Haven Station have this morning agreed that, for the present at least, there shall be one director for both the agricultural stations of Connecticut.

We have had two entirely separate stations in this small State, each managed by a separate board and each having its special lines of work quite distinct from those of the other. For the present, at least, it is clearly inadvisable to make a physical union of these two stations. Neither the Storrs Station could be moved to New Haven nor the New Haven Station to Storrs, without great expense, interruption of work, and other disagreeable consequences. The time may come for such a physical union, but I believe all who are well acquainted with the situation agree that that time has not yet come by any means.

The loss of Professor Clinton, director of the Storrs Station, who goes to a wider field of work and usefulness, and the need of choosing promptly his successor have led the Board of Trustees of the college to propose, and the Board of Control of the New Haven Station to accept the arrangement of having the director of the latter station also serve as director of the Storrs Station. The arrangement must be regarded as in a way experimental. It is an unusual but not unknown proposition. Thus in New Jersey there are two stations, each with its separate board of managers, and separate funds, separately administered, but a single director for both stations. In Louisiana, I understand, there are three stations and one sub-station, two separate boards of trustees and treasurers, but one director for all.

The things which it is hoped may be accomplished by this arrangement in Connecticut are a closer and more cordial co-operation between the two stations, which will tend to greater efficiency and force in their work. I hope that this co-operation in the general management may also effect a better acquaintance and mutual helpfulness between the heads of departments in the stations, the men who are actually doing the experiment and research work.

It is not intended that the funds shall be in any way used otherwise than at the present; the Storrs fund will be spent at Storrs, as before; the New Haven funds at New Haven.

If I may be allowed a personal word, let me say that as an employee of the Connecticut Agricultural College it is my wish and intention to serve the Storrs Station and the agricultural college with which it is connected with absolute loyalty to it and all its interests.

I have undertaken this added work (at a time in life when, after thirty-five years of service, one does not naturally look about him for more work to do) with much misgiving. I willingly undertake it however, in the hope and on the chance that I may be of service to the farmers of Connecticut, and may help to harmoniously solve the problem of the station.

Now let me say a word about the real place of the stations and of the college in the restless effort to increase the nation's food supply and the purchasing power of wages, and to decrease the cost of living, by more intelligent, intensive, and *paying* farming. This will not come about by booming or boosting methods so popular now. The walls of Jericho fell down flat when priests blew trumpets and the people shouted with a great shout; but we have no record of any sound building ever done with that kind of tools. No, you may shout,"Back to the land forever," but only the incompetent and foolish (the agricultural goslings) will listen to you until farming is made profitable to more of the men who are and have been "back to the land" struggling with lack of banking facilities, transportation troubles, labor troubles, Board of Health troubles, and the troubles of an unrestricted competition in production battling with a well-organized, shrewd combination of buying and trading interests. In all this are political, social, and economic problems to be solved by other agencies. The college and stations are chiefly concerned with the question of farm production.

The special office of the college is to teach young men and women the ascertained truth regarding this kind of production,—agricultural science,—which is the body of known agricultural facts placed in orderly arrangement. The college must, to quote the words of Professor Johnson, one of the greatest of agricultural teachers, "set these facts forth in proper order and in plain dress, for their legitimate and sober uses." Incidentally, the college must also teach all of its students the art of farming which can be learned away from their individual farms. These graduates must, if they are to make any return for their education, which has cost the State much, be demonstrators and teachers by agricultural practice in the places where they live. A State-taught farmer should feel himself a servant of the farming community where he lives. He just "makes good." Any education is no more an asset than it is a debt to the community.

The station has quite another function. It is not, in the ways I have just named, an educational institution. It must stand for research, painstaking and strict. Its problems are to search out the causes of things not yet explained; to solve questions in all branches of farming which can be solved by natural science, but which the farmer has not had time nor means or special ability to puzzle out for himself, and so pass on to the college and public, a new truth of practical value.

I must resist the temptation to enlarge here on this matter of the station's work and needs, which is not my special point here.

Until now the college and stations have striven to do these things which I have mentioned, and at the same time to do a different thing, viz: to carry their results to the farmer, not only through their graduates and by their bulletins and reports, but also by field meetings, exhibits, farm institutes, and correspondence. (During the last year the New Haven Station's correspondence alone has required the writing of about twelve thousand letters and reports,— forty for every work day.) These endeavors at popularizing their work (making it known throughout the State) have cost very much in time and effort, which is just so much time and effort taken from their regular and appropriate work.

Throughout the country this strain has been felt, and Congress and many of the States are busied with plans to provide a new and distinct agency, connected with the colleges, which shall take from the colleges and stations the work of carrying agricultural knowledge to the farms and farmers and farmers' gatherings of the State, and leave the State institutions in the uninterrupted work of teaching and experimenting. This plan is in the experimental stage. Wisely managed, it will undoubtedly be of great value.

Henceforth the college professor can and *should* devote almost all of his time to study and class instruction, the experiment station worker to study and research, and the extension worker to study and the popularizing of agricultural knowledge. They must all be students, or they and the system will fall down.

I do not mean that the college professor shall not do some research work, or that the station worker shall not do any teaching, but that each of them must bear one as his special burden, and the other must be quite subordinate,—a sort of relief or pastime.

So this is rather a turning point in the development of our agricultural educational system. Many wild-eyed schemes will, no doubt, be proposed. Some will have to be tried. Model farms and branch experiment stations are beginning to be proposed. I should like to say one word (of personal judgment) about them. What is a model farm? It is a farm whose proprietor, with large capital or small,—it makes no difference which,—has earned his living wholly from his land, and has improved its market value in the meantime by more than the interest on the first value, in a word a farm that pays.

We have got model farms in this State. One of them, for instance, was owned by Mr. Pierpont, a worthy example of what education and indomitable energy on the farm can do, and whose untimely death we all deplore.

Private ownership, private capital, and private skill and energy are the essentials. It seems to me that a State-owned, State-managed, model farm is a contradiction in terms.

A State farm for instruction like the one at Storrs is one thing,—and a good thing,—but a State model farm is like a self-winding clock that needs a winder.

Take a single example. A State model farm would have a model orchard. It would be a lonesome place. Where would any one of intelligence go to learn about fruit-growing? To the "model orchard?" Not a bit of it! The Henrys, Barnes Brothers, Lyman, Hale, Rogers, and many others have truly "model" fruit farms. Sometimes when visitors and peaches are both abundant I imagine they wish one crop or the other would fail.

An experiment station in each county is another delusion. Demonstration work under the management of extension workers, certain experiments under the care of the experiment stations, will be helpful. The New Haven Station now has work of this kind in four places in the State. But to supply stations and station managers is to work confusion instead of co-operation.

To sum up. The aim, as I understand it, is to have the agricultural college stand for fundamental, sound education in farm science and practice. The station is to confine itself chiefly to scientific investigation and experiment.

The extension department of the college is to carry to the farms and farmers of the State the products of the college and station, and to encourage and assist farmers to put improved methods of farming to practical use. These three agencies are to be so united in their work that each shall help the other, and that conflict of teaching and practice shall not any more exist. Each asks for and deserves the united support not only of farmers, but of all who have a care for the welfare of this State. (Applause.)

THE CHAIRMAN: I believe this completes the program for this evening. We will adjourn until 9.45 tomorrow morning, when I hope to see you all here. Thank you for your attendance tonight.

SECOND DAY — MORNING SESSION.

Meeting called to order at 10.15 o'clock by Vice-President Wilson H. Lee.

THE CHAIRMAN: You who were here last night heard a sample of Massachusetts oratory, and I am very glad that we have a man here this morning who lived near me in my native town and who was born and brought up on and runs a farm, as I understand it, too in Greenfield, Massachusetts, twenty-two miles from my native town. They raise good men, you know, up in that country; and what he don't know about sheep isn't hardly worth knowing.

I take great pleasure in presenting at this time Mr. Gerrett, of Greenfield, Massachusetts, who will talk to you on sheep husbandry. (Applause.)

FRANK GERRETT: Mr. President and Gentlemen: I thank the chairman for introducing me as he has. Those of you who were here last evening and heard Mr. Gardner I am sure will think there is a great chasm between him and me, in what we have to say and in our way of saying it.

I am going to talk to you a little about sheep, but I am not going to talk to you as a professional man or professional speaker, for I am one of the old-line farmers, and we do a little of everything in order to get a living. We have a farm and have to get our living off the farm, and sheep have been kept on our place probably for a hundred years. The house is many years older than that, and the barn probably older than the house. We don't represent any particular kind of sheep for breeding purposes to sell for high prices. We aim to keep a good flock of sheep, and we keep them for the lambs that we can get. We are in the early-lamb business, but I don't think we would be, wholly, if we were not situated just as we are. The sheep that we get are the Southdown and Hampshire varieties; and if we can get them with a little fine wool blood in them we like it, because we think they breed a trifle earlier, and that is a great factor in getting early lambs. There is one thing about the sheep business that has not been reached yet with us, and that is the Board of Health has not got hold of the management of sheep as it has of cows, so we have escaped that great annoyance, so far. How long before it will tell us which way the sheep should stand when they are eating their evening meal, or how many feet of air space we should have for them, I don't know, but I suppose it is coming, as things are along that line.

The sheep that we keep are sheep that are bred wholly for the lambs. The years have gone by now for the wool product, to any great extent. We try to get lambs as early as we can; but I am of the opinion that if were situated a little differently I would rather have lambs come in April than to try to get them as early as we can. It isn't possible every year to breed sheep to have lambs early in the winter,—Thanksgiving and along Christmas time. There are years when you can do it, and you almost feel as if you had the thing right down fine and could do it every year. For three years in succession our lambs came along in November and early in December, and then for two or three years we didn't get lambs till February, which, to my mind, are not as profitable as sheep bred for April. If the pastures were situated conveniently for us I think we might breed sheep to lambs at that time. It is not necessary, and I couldn't do it to any advantage to you or fairness to myself, to go into the statistics of the sheep business of many years ago throughout New England, to give you the number that used to be kept or the difficulty of the keeping of those numbers now, because I think those times have passed; but I believe if people were situated right a great many more sheep could be kept and kept to advantage on any of the New England farms than are kept. We have a different market than we had in those days; we have a market that is nearer home; and we can sell the sheep and sell them to good advantage, and it is only a matter of opinion with many people who are not in this business; you find farmers who are going into it, and that is usually when sheep are high, but in two or three years you find that they are all getting out of it and the prices are very low. I never could understand why people wanted to do it; I never could understand why they wanted to unload,—I can see perhaps why they wanted to buy if things looked prosperous and business was good,— but I never could quite understand why they wanted to unload and unload all at once, and unload regardless of price; with the markets we have now, with small flocks of sheep called for, with us, and I presume with you, it is the same to a certain extent, and I cannot understand why a man can't unload then, and unload them to good advantage, if he wants to go out of business, instead of throwing the flock away. Right in my immediate vicinity last fall I knew of several flocks of sheep being sold at $2.50 and $3 apiece. I am of the opinion that if those people had taken a little more time they might have got a better price and got a good deal more money and have gone out of the sheep business in a more graceful way; it would have been better for them and better for the rest of us who are in the business. I want to call your attention to this fact,— that if you go out of the sheep business go out of it gradually; take your time, for there is hardly a flock of sheep anywhere where one cannot pick out a few head for market and the more you pick out the easier it is to put the rest in cheap. It naturally creates a certain amount of discussion when people are unloading hastily. Why are they doing it? I have never been quite able to solve the problem.

Take sheep up for early lambs and it is a continual push from fall to spring and costs you quite a bit of money to keep them. If you are successful in getting your lambs early there is good money in it; if your lambs can come in December you can get them away early and can get good money. Fifteen dollars is the highest we have ever received for any. We have sold a whole lot of lambs in the springtime that would average us $10.50 net at the farm. Those years were exceptional ones. You have got to get them early and have everything complete, and they have got to do well from beginning to end in order to get them out, because they must grow fast and be in fine shape when they go; you also must have a fairly good market, as some years will be better than others; then some years we have to compete with Western lambs from Western New York or Kentucky that are rivals with us in the Boston market; and they are a great factor in creating the prices. I read a great many pieces in the papers about the lamb and sheep business, but it takes time, patience, and money. You have got to have a good flock of sheep in order to get them out; and you want to be certain to get them early in the year; if you don't get them till February you better get them in April. If you can get your sheep to breed in April and you can do that every year, then you have got to have a little extra feed for your lambs, but that is practically off the farm, which would bring you neat returns, and that is what we are all after. With people who are coming into the rural sections now, spring lambs are selling, and we are having a better market at home than we have had in years gone by when we had to send them to the Boston market.

If you are in the business, and intend to keep in it for any great length of time, there is no better thing you can do than to have a few demonstration meetings,—some meetings or gatherings,—and give the young people a lesson in dressing them. If you can do that you will certainly get a larger percentage of profit for your sheep and lambs; you are in a position to sell them at all times and, if you can do that, you will many times be able to get them all on the market, while if you had to take them off and have them dressed and sent away you would lose a sale; and if you took them over to suit your own convenience it might not be agreeable to the other party, or just the other way; if you took them at their convenience it might not be at yours, and you would be the loser. For that reason I would suggest that you do as we have done in Massachusetts,—have some of those demonstration meetings and let the young people who keep sheep learn how to dress them. By doing that you will find that you will be great gainers.

In keeping sheep keep them for the mutton; don't keep them for their wool, for that is a by-product. Years ago we used to have many people drift to our place every spring looking for wool; you probably are as familiar with this now as I am, but it is entirely foreign to what it was at that time, and there are but one or two people who are coming through our section buying wool now. The lamb business is as good now as it ever was, and it pays us as good prices as ever; that is what we cater to. The sheep should be kept up in good shape; don't try to breed too close, because if you do you will get a poor crop of wool and poor lambs, and the chances are you won't get any. But if you feed them well they will give you good returns. Those of you who are in the business and are breeding sheep (pure breeds) and are selling them for breeding purposes, take my advice and never sell a sheep to a man unless you are thoroughly convinced that he can make a success with it; don't sell to him unless he is situated so he can take them and take care of them in good shape; don't sell any to him if he is buying them just for the novelty of the thing, regardless of surroundings.

A few years ago a man came up into our section and organized a stock company, which bought several thousand sheep and put them out among the farmers on shares; the company was to have a certain percentage of the income and the men who took the sheep were to have the rest. I don't know how much the men who took the sheep got, but the company didn't get anything. It put them out to everyone who asked for them, regardless of how they were situated, whether they had suitable pastures or suitable barns, or whether they were fenced or not. I was one of a committee to go and pick up the remnants, gathering them in and trying to dispose of them, and it was a sorry looking lot, and I felt sorry for the men who had the sheep about as much as myself, for I had a little money in it; but most of the money came from or was put in by the man who organized the company and his friends, so we didn't feel so badly about it. The man's circumstances were such that he could keep them; but there are those who are so situated that they can keep them to advantage to themselves; but a man who is doing a dairy business ought not to go into the sheep business entirely, and very few people want to go into the sheep business wholly anyway, unless it is in some section where it would save lots of transportation and they have large pastures and know it very well. I am inclined to think that they could get net returns that would be fairly satisfactory to them; but there are many people who take sheep who ought not to take them, and I believe those who are breeding pure-bred sheep and are selling them for blood and service ought to exercise the greatest care in selling them; while they exercise great care in breeding, they ought to exercise great care in dealing with the man who wants to buy, and not try to get them into bad quarters, regardless of conditions that exist.

Years ago they used to fence for sheep with stonewalls, but sheep business dropped off and the fences became old, and when they went back into this business again many of them found that they were not in a condition to care for them. I remember a couple of years ago a member of one of the organizations made a report on fencing that he had been setting up, and it was a very good one; but it occurred to me that it is hardly necessary for anyone who owns live stock and keeps it on his own land to have to fence it in, except for the protection of his own property, and as a good citizen dealing fairly with his neighbor who doesn't ask that the same protection be extended to him.

We are fencing with wire fence thirty-five inches high. One twenty-four inches high on level land is high enough. Provided you are fencing for sheep and sheep alone a thirty-five-inch fence with a string of barbed wire above it is ample for sheep as well as cattle. We make a practice when we are fencing to leave the trees, if there are any, because they make most satisfactory fence posts. It is not an expensive matter to fence for sheep with American woven wire thirty-five inches high, which costs from twenty to twenty-four cents. It is easy to build it, and if you take the time to care for it from year to year you will find it is a very easy matter to keep it in shape.

I just want to speak to you a little about feeding sheep as we feed them; and let me say to you one thing. I am telling this absolutely correct, I am only giving you the way we do it, but if you get just one idea out of it that is good then I shall be very glad. We put our sheep in the fall on early-cut rowen; we don't feed them any coarse hay, because a sheep isn't fixed to eat that; it is a detriment to them no matter how much care you give them or how well you feed them with that hay; we put them in in fairly good season, feed them well, but never grain them until after they lamb, unless it is an exception. We may have one or two that have got by, but we usually never give them any grain until after they lamb; after they lamb give them all the rowen they will eat and eat clean, and we feed them corn, seldom anything else. Just as soon as they come in (two or three days after) we put them on the corn rations. As soon as the lambs come we begin to get them fat, starting to feed them just as soon as they commence to eat. First we usually give mixed feed, bran, grain, a few oats, and a little cracked corn or else cracked oil meal (they crack it for us where we buy it) and just a little cracked corn. Start in with a mixture of oil meal (one-quarter corn at least) mixed with grain and oats; and water them; if you haven't water where they can get it, water those lambs as often as three times a day; keep them full of water, keep it where the sheep can get at it and you will be surprised how much they will take. Salt your feed a little for the lambs and they will consume a lot of it, and give them plenty of water and it will do you good to see them grow. It has been said, you know, that sheep can live without water, but they are a good deal like a man; they can get along without drink, but if you give them a chance they will take it, and it is only fair to give them a chance, when you are giving them water and nothing else.

I saw an article in the paper a few days ago; a man had a lamb weighing forty-five pounds that weighed when dressed thirty-four pounds. I haven't been able to do anything nearly as well as that. I think the best lamb I ever sent to the Boston market weighed fifty-five pounds. That was on Friday, and in Boston the next Tuesday morning it weighed thirty-five pounds, and I considered that a very nice lamb,—much better than the average. Lambs coming early in December can go on the market. There is always a market for early lambs that dress about twenty-five pounds. They will take them at twenty-two; so if you can get lambs early you can get them off so much sooner; you don't have to put so much fat on them to get more money.

As the season advances and gets to be a little colder, when it gets into February and along the first of March, you have got to have lambs dress thirty pounds to figure on the Boston market. The weather, to a certain extent, has something to do with the feeding and fattening of the lamb. In good, clear, cold weather,—clear and not too cold,—lambs will fatten pretty well, but there comes a time when it gets so cold they have to be shut up.

I heard a man speak at an institute in Greenfield a few years ago; he was a sheep raiser in Vermont and was a very entertaining speaker. He had been in the sheep business all his life and told about the kind of sheep he kept and how he kept them; his sheep ran out doors all winter and they lambed out of doors; he didn't care if a lamb was dropped in the snow, he never lost it. Now that is an unusual thing. We couldn't expect for a moment to save many lambs in December, January, or February if we left them to lamb outside. They want good, warm quarters, and must have them, and they have got to have good attention up to lambing time. If the weather is clear and dry it is never too cold for sheep outside; if it is stormy, don't have them stay out. Snow and rain get into the wool and it takes several days for it to dry; if it is good wool it is said it doesn't do them any harm; we don't think it does them any good, and we are always very careful when storms are coming on to have the sheep put in.

Just as soon as our sheep begin to lamb in January and February we shut them in close, often having them just as near together as we can get them,—almost closer than is really a benefit to the health of the sheep, but we have to do it in order to save the lambs. If it is a very cold night we have a regular practice: we get two boxes like large dry-goods boxes (we have some crates made for the purpose,—knock-down style, collapsible); we put them together about the size of a dry-goods box and drop them over the sheep and lamb and throw a plank over the top; the heat of the animal warms the lamb and usually in the morning we find them in good shape. If you have sheep that do not own their lambs you might well do that same thing, and many times they will own the lambs whereas they would not do it if they were allowed to run at large, and you may save the lambs that way; you will save a great many that way if it is very cold; especially if there are two lambs, where one is left and where the mother is giving attention to only one you are liable to lose the other. I wonder how many of you there are in the sheep business who never lost a lamb? We have; we have had fairly good luck with them, but if we had every lamb that we have lost our farm wouldn't begin to hold the sheep, if they were alive. It isn't possible, in my opinion. There may have been some who are so fortunate, and if there are I am glad of it.

One of the things that is under discussion a great deal with us in our State, and I suppose it is with you, is the dog law. The dogs have had a great deal to do with discouraging people from keeping sheep. I have followed the discussions in the papers from year to year, and I think we have the best dog laws in New England; and in getting them, the peculiar thing is, we have always had the assistance of the dog men; never have had any opposition; we usually have consulted with some of them, and have had good results. I am going to take just a moment to rehearse them to you. Our dog licenses are $2 for males and $5 for females. That money all goes to the town treasurer. The town treasurer turns all that money over to the county treasurer. It goes into the general fund of the county. If there are any dog damages up to $20 the chairman of the Board of Selectmen of the town where the damage is done makes the allotment; no one else has anything to say about it. The chairman of the Board and the man who has been damaged appoint a third party, and those three make the appraisal; they make the allotment, if it is for sheep, for those that are killed and for those that are damaged, and they also pay him for the time in looking them up and getting them back; that is turned over to the chairman of the County Commissioners. The County Commissioners up to a few years ago had a right to allow that claim or had a right to reduce it; it was thought that it was hardly fair to give them one privilege, to reduce it, and not give them a right to raise it; now they have a right to reduce or raise that appraisal, as it is possible something may arise to change their opinion from the time the allotment is made by the Selectmen until it reaches the County Commissioners. The County Commissioners issue an order and it is taken out of the general fund. At the end of the year the general fund goes back to the various towns.

We have had legislators ask if it would not be a great benefit to us to have dog licenses raised. That is the only thing we have got to hurrah over in our State. If anyone should put a bill of that kind in the Legislature I would guarantee that the Statehouse in Boston would be full to overflowing, most of the number in opposition to that amendment, women with dogs under their arms, going there to protest against any such thing as that. We are not justified in asking for anything of that kind, because we never spend the money we raise from dog licenses. I believe Franklin County is the highest one in amount. It has spent around sixty-five per cent, and the highest we ever spent in Worcester County, I think, never has been more than three or four per cent, so you see we don't spend all we receive, and it wouldn't do to increase the license. Another thing, we have a law there where an agent is appointed by the County Commissioners to investigate damages done by dogs and to look into such cases as call for examination. If there are any dogs about that a man feels suspicious of he reports them to the agent, and he goes to see this man and usually fixes it up in some way by killing the dogs. If the man is persistent in getting after him then he has got to do one thing or the other: He has got to find those dogs or give sureties for their good behavior; if he can't give sureties for their good behavior by a certain time, then he has a right to take those dogs and kill them. It is fair to the fellow who keeps the dogs when he has no use for them, but it is not fair to the other fellow to be put to such expense and fear of their getting on his farm without protecting him from those people. It has been a great factor in helping us to dispose of all the unruly element of that kind.

Two years ago we raised the bounty for killing a dog from $10 to $25, which has been one of the greatest money savers to our dog fund that we have ever had. Supposing a man had some sheep killed, and he had to put a man out there and paid him for it, and one night a dog came in and the man shot him, and he got the $25, it would seem that it would save the county a large amount of money, and we feel as though this has been one of the best things to clean out a certain lot of dogs. We can't lay it to a certain lot of dogs, because it is a fact that they sometimes get into mischief and get to running when they never think of doing anything, and we are surprised to find them engaged in this kind of work. That is liable to break out and has occurred all the time. The last law I speak of is one of the best ones that we have made to foster the industry along the dog line; and when we passed this law in the Legislature a few years ago they said they would give it to us out of courtesy, but didn't think it would work to any advantage; we thought it would, and it is one of the things we are glad that we got. The law relative to taking care of dogs that are unruly,—dogs owned by people who are not financially responsible,—is another thing. A dog, too, in our State doesn't really have much standing anyway. If he injures you, the man who owns him is liable for the damage, no matter if it is done in his own yard; no matter if the dog is tied up on his own premises and you go there on legitimate business and are going up to the door,— the dog may be tied, but long enough so he can reach you, — the man who owns him is liable; he is not only liable for damage, but liable for twice the damage; If you should bring your damage to $300, $600 is the amount the man would have to pay; so you can see a dog doesn't have much standing with us, although we have a lot of good ones I suppose. Be that so, in the last few years we have had a great change in conditions.

Years ago when men were going through our farms or over property it was nothing unusual, for we felt it was some one in that immediate vicinity; but today it is an entirely different class of people, as we have a large percentage of foreigners who are coming in. A few years ago a gentleman over in southern Berkshire, in Massachusetts, who is now elected to Congress, put in a bill relative to the trespass law. It has been a great factor in keeping people off our property. We have lost a great many sheep in more than one way in years gone by by those people's trespassing on us; we have lost them, and we never had any right good evidence as to just how they went, but this law is a broad one, relative to trespassing, taking down fences, stonewalls, etc., and if you haven't anything of that kind in this commonwealth, those of you who live in rural communities, I can assure you it would be well to look into it. We didn't have any trouble in passing it in the Massachusetts Legislature and it doesn't seem as if you would here; but with us, with no opposition to it, it is a good law and it will protect you, your people, and your property. It refers not only to what I have stated, but it refers to one thing that is a great damage to us who have timber land. It prohibits those who are cutting along the highways from stepping out into our lots and cutting away our lumber. We have had a great deal of trouble with that, but it is remedied to a great extent; and for that reason all those people of that element whom you can keep off your property and keep away from your private pastures just so much the better it will be for your sheep.

The sheep industry in New England will never come back, in my opinion, to where it was years ago. There is nothing to warrant it; but there is an opportunity for a good many people to keep a few sheep, to keep them in a good way and at a profit, and to sell them right from the farm to the consumer. The people who are coming into these sections have got to be fed, and they want to be fed with the best you are able to produce too. There is another element that comes in; they like to be fed with mutton, but they are not as particular about the quality,— the Italians. They are great consumers of that line of meat, and if you have something that is not quite up to date and you are able to make a price to them I see no reason why you can't dispose of it at a price that is fair to you and fair to them.

If there are any questions that you wish to ask me I would like to answer them if I can; aside from that I thank you.

MR. ———: I would like to ask Mr. Gerrett how many sheep he is keeping on the farm now.

MR. GERRETT: We keep about fifty on hand.

MR. ———: What class of sheep do you find most profitable in your work? what class of ewes?

MR. GERRETT: We get Hampshire ewes, with a little fine wool blood in them; we like them and we think they breed a little earlier.

MR. ———: Did you ever try the Dorset blood for lambs?

MR. GERRETT: I never have. Mr. Avery, who is quite a large breeder, has bred to Dorset sires, and he has had lambs in November and December, and they sold for good prices. He lays it to the Dorset sire. Whether there is anything in it or not I don't know.

MR. ———: I think in this section the Merino crossed with the Horned Dorset is the best that I know of.

MR. ———: What is your experience with the nodular worms?

MR. GERRETT: I have never had them on any sheep in my life; if they have any ticks we usually put some Asiatic fowls into the pens and they will clean them out.

MR. ———: Don't you think a man in buying sheep ought especially to try to find out if they are diseased in any way?

MR. GERRETT: Yes, if he can.

MR. ———: Don't you think it is wise to have a little oil meal to use during the winter?

MR. GERRETT: That depends wholly on your feed, but if you have good rowen never spend your money for grain. We cut the second crop; most of our crop is grown on land that is top-dressed every year, and we seed down occasionally. It won't do much good to grain your sheep if you haven't good hay to go with it. I know a man who bought some sheep and paid a good price for them; he told me he was feeding them grain and oat straw, and he had the hardest looking lot of sheep I ever saw. If he had used a little rowen and taken out his oat straw he would have been better off.

MR. ———: I misunderstood your remedy for ticks.

MR. GERRETT: If you can get two or three good hens to stay in your sheep pens, get twenty-five, thirty, or forty sheep around them and they will clean the ticks out every time so they will disappear. You won't know where they have gone. It is the easiest remedy I know of.

MR. ————: What do you refer to as coarse hay?

MR. GERRETT: Coarse Timothy hay.

MR. ————: No matter how early cut?

MR. GERRETT: Of course that would make quite a difference, but you ought to at least cut it very early; I think in April.

MR. ————: What is the matter with good corn fodder?

MR. GERRETT: That will do for a filler, but you want something a little more substantial behind it.

MR. ————: I would like to ask you about the expense of buildings and the investment; what the returns are on sheep as compared with dairy cows. Is it more expensive with sheep, including the buildings and all that goes with the care of sheep, or less expensive than to keep the dairy cows, and what is the equivalent in returns?

MR. GERRETT: Do you mean the equivalent returns from sheep?

MR. ————: Yes.

MR. GERRETT: I couldn't tell you about that, but, if any, I should say that the cost for fitting up for keeping sheep had no comparison with keeping dairy cows,—none whatsoever. After your lambs come and get started in good shape, and you have got a good, substantial shed where the sun can shine in on them, that is all you need,—just to protect them from the storm; and in February, when the sun gets up, keep them out in the sunlight; they will do better than anywhere else, with a shed that protects them from the wind.

DEAN W. A. HENRY: I wish to say, Mr. Chairman, that in my agricultural studies my work has carried me to every State in the Union and to Western Europe. I think I am familiar with the agricultural history of Connecticut. Your State was the second, or first, to bring in sheep from France,—the Spanish ones; and I have a recollection when your State, historically, was well filled with sheep. This has declined until the present low point. Now the turn has come, and there is many a man struggling with a dairy in this State. There are others who are going into agriculture in some of the lines, and I want to say that, to a person of the right temperament and with the proper ambition, with limited capital, relatively — you can't go into agriculture without capital —I believe there are splendid chances for him in this State. A while ago I by accident visited a farmer near East Hampton who had a small flock of sheep. I spent the day with him and asked permission later to go back, and I spent another day with him. I studied those sheep and came to the conclusion that that man was making more money out of his sheep than he had ever made in this State in dairy cattle. If some of our people who are struggling to make a fair living by their dairy would turn their interests toward sheep, starting in a limited way, it would give them more money. This gentleman has given us a splendid talk,— the best I think I ever heard,— and if each one would carry on his business in the way that he is conducting his I am sure that those persons would be found making a fine success of the sheep industry.

This farmer whom I spoke of sold all his lambs dressed to the summer residents in that town and he got from twenty to thirty cents a pound for those dressed spring lambs in the summertime.

But I want to say this: If you don't love sheep have nothing to do with them; you may hit the dairy cow with a milk stool, possibly, if you find a good opportunity, but the sheep is the most sensitive animal on the farm. And the reason I went back to see this man was because I wanted to study the man as well as the sheep. They hardly got out of his way in that little flock, and as he passed they closed in behind him, smelling of his clothes and rubbing against him; seemed to be as fond of him as a well-bred dog of his master.

Now in my college experience I had three shepherds; the first was a Scotchman, who left me through sickness; the second was a college boy. I paid him $50 a month for taking care of a very small number of sheep; kept him only a part of the time. That man could make sheep jump further and higher and get away from him quicker than any person I ever saw. The third was a German. The German came to me and wanted work; he was married and had a family. I started him at $35 a month, and soon saw that I had a master-mind and a master-hand. He has written probably the best book on sheep that was ever put into the English language,—the best written, best gotten up, the best from title page to its perfect index, with its splendid illustrations,—and he cannot write a sentence of English without spoiling the meaning of it. I suppose you read of the exhibit last year of six of the University of Wisconsin sheep; he won $1,650 in cash prizes, and I suppose you read in last week's *Gazette*, possibly, that the Wisconsin dressed sheep carcass in the fat stock show brought sixty cents a pound. That lamb was prepared by this man whom the University of Wisconsin started at $35 a month; it now pays him $2,000 a year. I can lend you that book published by Frank

Climax (?). Although he can't talk English, that man knows sheep as only few men do, and that book is full of his experience and wisdom, and I put it to you, and I put it to the young men of this audience that if they are looking about for an opportunity, instead of following some line that requires a great deal of capital and a large amount of experience, to hire out with this gentleman or some other man who loves sheep and takes care of them properly. I would like to see some of the young men take this up, and when the agricultural college at Storrs starts out with those demonstrations I wish it could start some sheep demonstrations; for, as I said, this farmer is making more money out of his little flock of sheep, relatively, several times over than from his dairy cows, for he keeps them well; and I believe there is more money in sheep in Connecticut today than there is in dairying, unless one can find the highest prices for his product and use a great deal larger capital in his business than he uses in sheep. (Applause.)

The Chairman: In the next year there will be more sheep breeders.

We are extremely fortunate in having with us a member of the experiment station of New Jersey, who will talk to us on the breeding of horses. I think very many of us are behind in that feature of farming. I know myself that I have some good mares, and that I would lose very little of their work and might get a number of good colts at not much expense. When we come to buy horses we know what they cost, but we are not always sure of what we are getting any more than perhaps we are when we are breeding. You have heard the story of the man who met the horse jockey and asked him if he knew where there was a horse for sale. "Why, yes," he says, "I sold Bill Jones one yesterday, and I think you can buy his." (Laughter.) And that is about the way when you run up against them.

Professor Meinkler will talk to you on the breeding problem and also on soil fertility after he has touched on the breeding problem. Professor Meinkler of New Jersey. (Applause.)

Professor Meinkler: Mr. President and Members of the Connecticut State Board of Agriculture: I feel just a little bit out of place in Connecticut, because this is only the second time that I have been in this grand little State.

I am reminded of the story of the farmer who attempted to market some of his products. Driving the old white horse along the stone pike with the vegetables that he was taking to market, he was winding along the road in sort of an unconcerned way rather early in the morning. He turned his load to the right as he heard the honk-honk of an automobile; naturally he pulled out to the wrong side of the road. The man came along maybe faster than he thought he was coming, and tipped over the wagon, spilling the old man and his vegetables out, but it didn't hurt him at all. He got up and picked the vegetables up one at a time and had just got them in his wagon and got started again when along came a motor-cycle and did the same thing over again. The old fellow looked around and said, "Well, I didn't know the thing had a colt!" (Laughter.) Now in New England I feel something like a colt when I hear such speakers as Dean Henry and look at this audience and see it made up of men who have succeeded in the breeding of live stock and other lines of work as well.

I don't want to start in my discussion of the horse-breeding question until I second, for I can't add anything to what has been said regarding the possibilities of sheep-raising in the East. In fact, gentlemen, I am convinced that the agricultural and animal husbandry possibilities and opportunities are in the East rather than in the West, as we are inclined to think, unless we give it serious consideration.

It was my good fortune to hear Mr. Collingwood, editor of the *Rural New Yorker*, predict what agriculture will mean fifty years hence in the East; and if I quote him correctly he stated that in fifty years within fifty miles of the center of New Jersey there will be thirty-five millions of people to feed. A man can possibly get long without luxuries, but he cannot get along without food; and the farmer who produces actual food products,—mutton, the best one that I know of at the present time,—is going to be in a commanding position a few years hence. The problem of the East is, with us, maintenance of soil fertility; and if you can show me a single animal that adds more fertility to the soil and a greater income to the actual money in this State than the sheep that you have heard about I am here to be convinced. I think too that the small flock is the one that we should tie to. It was my good fortune to be superintendent of the sheep department of the International Fat Stock Show at Chicago, and I heard Dean Henry's friend speak in broken Dutch about his sheep. I had the opportunity of seeing him lead out that champion Southdown wether that won the carcass prize; it was also my privilege to see Uncle Dick Stone bring into the arena the Oxford wether, a cross-breed animal, and take away two ribbons. This is another point that I consider very essential: Owing to the fact that the foot and mouth disease practically kept out the imported sheep this year, it started the American and Canadian breeders to raising and feeding their own stock, and the result was that the best mutton exhibited at Chicago this year was the product of the skill of the American breeder and the American feeder.

Now I consider that a point well taken, for in years gone by we have imported a great many sheep, but this year, when we couldn't import them, the breeders arose to the occasion and produced on their own soil, in their own land, the highest quality of sheep, and made the best exhibit that has ever been made at Chicago. As an animal for the converting of rough fodders into edible products the sheep is without a peer; it will do this without expensive methods of preparation. We have to go to some expense when fixing a great many of our food stuffs for dairy animals. With sheep, of all animals, you can convert your farm products into edible foods at less cost, and they will be of the greatest value when they are finished. It was upon the experience of those shepherds who were at the International at Chicago, that the future of the sheep industry depended, it determining whether the small farmer would keep a little flock.

We hear of the greatest number of failures in poultry husbandry from some enthusiast who reads about some other enthusiast making a mint of money out of keeping a few birds; he has the money and not the brains and he invests in some large, expensive poultry plant, and he fails. The farmer today who is interested in live stock and who loves sheep, as Dean Henry has suggested, and will tie himself to a small flock until he gets the experience and the necessary knowledge, then he can produce mutton products very successfully.

Now the question of horse breeding is one of the greatest importance to me. Five years ago I went through New Jersey in an endeavor to find out the number of farmers who actually produced their own colts, and on only ninety-five of the farms was a colt raised that year. Think of it! On only nine per cent of the farms was a colt raised that year! I went still further and investigated, trying to determine the type and usefulness of that breed of horse that was being bred, and I found out that the average farmer in New Jersey was keeping three or four or five misfit mongrels to do the work that two typical farm work horses could accomplish. What did that mean? I found still further that the farmers were not producing that type of horse that was of the greatest usefulness on their particular farm; and, furthermore, they were dependent almost entirely upon the Western grower and producer for their surplus animals. Now if one man gave me this experience a dozen of them did the same thing, that when they purchased one of those geldings from the West it was brought to them usually in the spring, about the time they were ready to go to work; the horse was taken sick, a veterinarian was called, a $25 bill, perhaps $50, was paid to the vererinarian, and the horse was not able to do real hard work for several months. Now add to that the original cost of that horse and it made a very expensive animal to put to work. And right along down the line I found the condition existing where they were paying unusually high prices for the animals they were buying. The offsprings they were raising were of an altogether different type, but they were trying to take that thousandth chance of producing a horse with a record, realizing that only half of one per cent of the horses that are trained are able to get into the two-thirty class; still they were trying to take that particular chance. Now I think just as much, gentlemen, of fast horses,—race horses. —I like to go just as well as anyone, but I believe that it is fundamentally important for the farmer who farms five days a week at least, to produce and keep on his farm the type of animal that will do the most work with the greatest amount of ease. We heard a great deal several years ago about the new automobile and the farm tractor going to put the draught-horse breeder out of business; but attend the market today and you find that type of horses, draughters if you please, is bringing more money than you ever paid for it before. The false prophet erred in judgment, and I am glad of it. And there will always be a demand for the right class of horses that you can produce in New England, and I am satisfied that just as sure as the success of the future dairyman depends upon his practice of growing on his own farm his own calves, so also does the horse industry rest with your producing on your own farm that kind of animal that is of the greatest use and the greatest service.

Now what did we do in New Jersey? We found that there was a scarcity of draught stallions; there was also a deficiency of draught mares. Now if we could in some way create interest and capital to such an extent that we could purchase and distribute in a given section a breeding sire so that the farmers would be willing to produce the breeding families. 'To that extent $20,000 was appropriated for use of the Live Stock Commission, bounties were paid and ten stallians was imported distributed in ten different counties in New Jersey through a locally organized breeder's association. The procedure was not a difficult one. We asked the farmers in a certain section of the State to petition the Live Stock Commission for a stallion, stating that they would guarantee a minimum of twenty-five females suitable for mating with that particular animal. As a result of it we have fifteen breeders' associations organized in New Jersey and fifteen stallions owned by the State distributed for service, and the farmers are also producing on their own farms colts that next year will be old enough for use. Already a good many of them have been sold at prices twice as high as those resulting from a sale of colts of the wrong type for the farmer's use. I believe in community breeding.

Why do we go to Scotland for our Clydesdales? Why does a man go to France for our Percherons? Why does one go to Waukesha, Wisconsin, for Guernseys? Why does a man go to the Island of Jersey for Jerseys? It is simply because the breeders in those respective localities have concentrated their efforts and produced one kind of live stock or one breed of live stock that excels the average type of that breed. If your local sheep breeders' association will concentrate their efforts and keep close to their organization and promote the sheep industry of this section you can concentrate interest and you can draw people here who want mutton just the same as the Scotchman has drawn the Commission to Scotland for Clydesdales, and as those other sections that I have suggested for the others. That is why I believe, as I say, in community organization; and those local horse breeders' associations that we have inaugurated and supported in New Jersey have been the means of stimulating interest and promoting activity, not only in horse-breeding, but in the breeding of other types of live stock as well; and the farmers are beginning to realize more and more that is to their best interest to grow these products rather than to purchase them.

I will not go into further detail regarding the local horse breeders' associations in New Jersey. Suffice it to say that they have been a means to an end, because in every single county where we put one of those State-owned stallions for service, three or four and in some cases five individuals or privately organized companies have purchased breeding stallions, and the number of pure-bred draught stallions has increased in New Jersey from twelve in 1908 to seventy-eight in 1912. Think of it! From twelve in 1908 to seventy-eight in 1912! We also have another law in New Jersey,— speaking of dog laws and others. We have a law there that states that every owner of a breeding stallion must take out a certificate before he can offer the animal for breeding service; and that certificate is based upon breeding and individuality. That miserable mongrel stock is to be put in the background and we will have a commendable sire, with a reputation for producing good colts. We will be able to put them both upon a platform, so to speak, and show the people by actual results the difference between patronizing a stallion that never did produce a good colt, that wouldn't sell for $100 in its prime, if it was emasculated and breeding to a stallion with a reputation,— something that has produced a colt well worth while. What is the result? In 1908 72 per cent of the stallions in service in New Jersey were grades and mongrels,—72 per cent! This year we have reduced that to 40 per cent. Think of it,— from 72 per cent to 40 per cent!

We found on actual examination that 22 per cent of the stallions in New Jersey were unsound, and we disqualified them from service. It was hardly safe for me to go into some of our counties, because I had agitated this horse question to such an extent that they pointed me out as the man who had lost them several thousand dollars. In one case a man had a stallion he had paid $2,500 for,—well bred,—a good one, as far as breeding was concerned, but it had ringbone. The Board disqualified that stallion because it was their duty to disqualify him, and the owner protested. We said to that man: "If you will bring in twenty colts by your stallion and the majority of those colts are sound, we will be very glad to reconsider the proposition, if it is within our power to reconsider it." He went out that very day and brought in fifteen colts. Nine of those fifteen colts had evidences of ringbone. We told the farmers that, and our campaign has been largely one of publicity; and as a result, of course, we did not grant a certificate to that individual stallion, and, furthermore, the public did not patronize him. And I might go on and give you a number of instances.

The greatest enemy whom we had in New Jersey regarding examination of stallions is today maintaining two of the State stallions. Now why? He shook his fist in my face and said, "I will not present my stallions before any Board for examination; that is interfering with private rights that belong to me; I will keep an unsound stallion if I want to keep him, and I will sell him if I please." I reasoned with the man, and I would say in this regard, we haven't had a single lawsuit. It has all been through publicity. I argued with this man and told him that the mare owners in his district were certainly entitled to the services of a better stallion; that he would increase patronage if he would put into his stable a stallion of acknowledged usefulness, with given individuality and known breeding; and he went to this and to that and the other man, and still another man, and they counseled with him and told him so and so: "I would present that stallion for examination before the Board and so comply with the law, and then if hardship results you have some recourse." He brought his stallions before the Board; one of them was rejected and the other one was passed. He doubled up his fist and said, "If you reject that stallion you must renounce five other ones in my county that I know are unsound." "We will be very glad to do that." Give us the necessary information, and if it be so found that those particular stallions are defective and are in service we shall insist that they be disqualified, and we did. He sold the unsound horse and finally decided that the horse that was sound was not good enough; he put in a bid for one of the State stallions and he is now keeping him and also another, and in that particular county in New Jersey he is getting a reputation for producing draught horses well worth while. I might go on indefinitely and give you instances of this sort, but suffice it to say that there is more interest in horse breeding in New Jersey today than anyone five years ago would have thought possible; and it is simply because we have worked in two ways. We have brought the farmer into a realization of the fact that a good sire is half the herd, but a poor one is the whole thing. Now I want you to get that statement: that a good sire is half the herd, but a poor one is the whole thing, and think about it.

There is still another attempt that we are making in New Jersey that is meeting with very good success, and that is the establishment and promotion of colt shows. If a man produces and raises a colt worth while it is certainly worthy of getting up a local exhibit and showing the people in that community what the result is. I know a brood mare in New Jersey that sold three years ago for $75. She produced a colt by a pure-bred Clydesdale stallion and that colt sold for $265 when it was eighteen months old. The mare was rebred to the same stallion and put up at public auction and sold for $250. Several colts that she had produced before, sired by mongrel stallions, were scarcely saleable. A lesson like that in a community will do more toward promoting interest in live-stock husbandry than anything else that I know of. So much for the breeding end. I am satisfied, that it is up to the farmers in our section to produce on their own farms the very best animals, not only for use, but for sale.

I am interested in still another problem, and that is the feeding problem; particularly of horses. I think you can grow alfalfa in Connecticut; in fact I know you can. The chairman said he had something like thirty or forty acres of alfalfa, if I quote him correctly. Now if you can produce corn, and I understand the record for corn in Connecticut in something like forty-five bushels per acre as compared with fourteen bushels for Kansas, that corn State,—if you can grow on your own farm corn for ensilage for your dairy cows and possibly for your sheep and for your horses, and alfalfa hay, you will do two things: you will maintain the fertility of your own farm and add to the fertility of it, and you will be able to feed your live stock cheaper than you have ever been able to feed it before. There are three problems for the dairyman today: one is the bill for the feed he is buying, another is the heifer calf that he is not producing, and the third is the poor cow. You can apply that same thing to your sheep industry. If you can grow alfalfa for your sheep, and corn meal, as the gentleman suggested, you will raise lambs cheaper than you ever did before, if you have been buying feed; and what is good for a sheep is good for a horse in a general way. A ration of alfalfa hay and corn or bran, with possibly crushed oats in season, will make it possible for you to maintain your horses cheaper than you could possibly do with Timothy hay and purchased products. The one thing that has killed a great many horses on our farms is Timothy hay. Not that it is not good horse feed, but it is fed in too large quantities. I believe Dean Henry will back me up in saying that a man who feeds his horses out of a large manger of Timothy hay so they can eat all they want is starting toward the first step of ruination, because a horse can't stand eating a large amount of hay in that way.

We have solved, in a measure, the alfalfa problem in New Jersey. Last year I think there were two thousand acres, according to Dr. Lipton's statement, planted or seeded to alfalfa, and it is a matter of observing three or four principles. I am not going into them in detail, just briefly. The first requisite is the selection of a piece of ground that is productive and naturally well drained; that is your first step. The second is the preparation of that ground, preferably by means of oats and Canada field peas. If possible, put your Canada field peas in early in the spring, keeping them to feed your horse during the winter months together with hay. Plow that ground reasonably early in summer, keeping the weeds down, and, as Professor Voorhes would say, "Seed that alfalfa on the fifteenth day of August at nine o'clock in the forenoon." Use lime inoculation, and an application of sufficient sulphuric acid to enable those plants to grow vigorously, and then attend to that crop after you have it once instituted. These, in my judgment, are the five essentials. I will repeat them: First, a naturally high and productive piece of land; second, a piece of land that has produced successfully a crop of corn or a crop of potatoes. That does very well. Third, plenty of lime. Fourth, absolutely perfect preparation of your seed bed. Don't try to grow alfalfa on lumpy ground. Perfect preparation of your seed bed by continuous cultivation, if possible, and then seed it with good, home-grown seed, preferably grown in Kansas or Utah or some of those Western States. We put it on fifteen pounds each way, fifteen pounds this way (indicating) and fifteen pounds the other way, and then roll it and press it down well after it is seeded. If you can use one of those press drills so much the better; and then after you have your field once established, cut it in season, not later in this section I should say than the tenth of September, and feed that; and if you have but one sheep I am sure you will grow alfalfa. I have heard Professor Voorhes say so many times, "If the farmers in the East would realize that the coming crop is corn and the second crop is alfalfa, and then market those products through types of live stock that are marketable and useful, a good many of the farm problems would be solved." I thank you. (Applause.)

THE CHAIRMAN: There is a pamphlet here on soil fertility that seems to be a good one, "Conservation of Soil Fertility." I have looked it over very casually. I believe Mr. Mitchell, who is in the hall, will furnish them to whoever wants one.

We will hear from Professor Bower as to why he awarded the corn prizes to certain exhibitors. Professor Bower.

PROFESSOR BOWER: Mr. Chairman, Ladies and Gentlemen: The corn grower usually has a purpose in selecting his corn by some standard rather than some fancy point. His first aim is, usually, to have a larger number of marketable bushels of corn per acre, which ultimately will lead to a higher net profit per acre. In order to obtain the largest number of bushels per acre it is necessary to select a type of corn that is adapted to the soil and climatic conditions. In order to do that his first problem is to get a corn that will grow; if he fails to do that, which may be due to poor storage or immaturity, he simply gets a loss on his investment in his seed. The next problem, perhaps the most difficult in purchasing seed corn, is to get the variety that he has selected, to mature; and perhaps the most important of all the factors is to get a kind of corn that will produce the biggest net profit per acre. It has generally been considered that the best profit per acre in corn-growing comes to the man who uses better methods in culture, etc., than his neighbor. While it is necessarily true with corn-growing, as it might be in other business along agricultural lines, for a man to get the best profit per acre in corn production, it would seem that the first requisite would be purchasing or selecting good seed that is adapted to his soil and climatic conditions. With the purchase of good seed adapted to his own locality, with proper culture methods, it would seem to give the best profits per acre for his production of corn. Of course culture methods would play a most potent part, but, as that is not given under this head, I will pass it by.

In selecting corn we usually have in mind our ideal of good seed corn. However that question may remain unsolved,—what is good seed corn? Is it the corn that wins prizes at some show? That question seems to be universally left to the practical corn grower to solve to his own satisfaction. In selecting your corn from any sample of corn it seems that the most important thing to bear in mind is the class you wish to enter. A common error might be entering corn without any knowledge of the class, which will naturally cause a discard without any reasonable consideration. For instance, if it is a late class, and an early class is entered in that late class a judge would naturally be justified in discarding it. Too often a selection of corn is made, the selector having in mind large ears, perhaps color, or some one point, without giving any general consideration or inquiring for information regarding the class being exhibited. It would seem that maturity would be one of the most important factors in the consideration of producing corn. Maturity can be easily learned by watching the growth of your corn crop during the summer, and the indications are very general in the selection of the sample to be exhibited. Poor germination is usually the outcome,— almost always the result of your seed corn; immaturity is one of the best indications,—an ear of corn that has a dark cob with the kernels less perhaps upon the cob, which in turn gives a poorly developed kernel which is held tightly down to the cob; a narrow tip, increasing through the middle of that dark-colored germ, which makes that ear useless as a production of seed corn. The higher production or the large number of bushels of corn per acre naturally tend to bring about a study of the kernel characteristics. The proper selection for this high production of shelled corn necessarily is one with a deep, broad kernel, proportionate in thickness; such a kernel would be upon a small or medium sized cob, while the large cob would produce the shallow kernel, mostly cob and low percentage of shelled corn.

In selecting a sample the character of the ear's uniformity not only lends to the better appearance of the sample but also to the production of a higher percentage or a larger number of bushels of marketable corn per acre. Also, in choosing it is better to select a medium-sized shank; that is, not to select for a large shank a large cob with shallow, irregular kernels at the butt; it is also bound to be of late maturity, while the medium shank with more depth of kernel brings the production of shelled corn perhaps to better maturity and may give us a very small cob. Another thing, husking back for about one third of the ear, if it is too small, will produce an ear of very low vitality.

Now as to the question why this sample won first prize for the classes in the Dent corn; it won first prize mostly because there was only one entry. (Laughter.) In the Flint corn class the sample that won the first prize was about the best sample in the lot; it was well matured,— much better than the one that won the first prize last year; was uniform in size, shape of ears, and kernel characteristics. However the character of the kernel in that exhibit was not as good as the one that took third place which if you will notice, has a very poor shank, is ununiform and immature; while in the division of the Flint corn entry in the late class, you will find that the sample that took first prize is not as mature as the one that took second place; the exhibit is just as uniform and produces a much better kernel. The kernel characteristics in the late corn division are put ahead over one which is is a little more mature perhaps, as it is entered in the late class. In division three,—the best entries of any Flint corn there are only three entries, and it was not a very close competition. The one which has a very broad kernel and especially good germ.

In the boys' exhibit in conferring prizes it is entirely different from the other entries in awarding, because it is giving the boy the first prize who won the largest number of points, and those points are rated upon four different features: 30 for the greatest yield per acre, 20 for the best ten ears, 20 for the best essay, and 30 on the highest net profit per acre; so the boy gets the highest number of points who produced corn that is perhaps a little immature, while the boy who got the first placing there didn't get first prize because his essay and his other points did not bring him up to the highest total; so in the exhibiting of corn it seems to me there ought to be a class in which corn is entered and a uniformity of the exhibit, and maturity and character of kernel.

Are there any questions you would like to ask? Thank you.

THE CHAIRMAN: On account of Professor Clinton's having a new job, Professor Bower gave us this talk.

I see in the first row our friend, Professor Clinton, and I would like to call upon him for a few words in regard to the work he is going to do for the State. (Applause.)

PROF. L. A. CLINTON: Mr. Chairman: I thank you for calling upon me. It is a thing that I have been wanting to do,— to stand up here for a minute and speak about this work that Connecticut ought to be leading in.

When I went to Washington to take up my duties, I looked over the map which illustrates graphically where this work of farm demonstration has been started; they indicate by a blue-pencil area, where this work is taken up. I found New York State well covered over with blue patches, Pennsylvania with certain blue marks around the State, and a little blue patch up in Maine, but when I looked at Connecticut it maintained the even color in which it was printed, indicating that this work has not yet been started in Connecticut. Of the $300,000 that was appropriated by the last Congress not a dollar has come to help Connecticut agriculturally; but those fellows out in New York State and Pennsylvania have been gobbling it up, and we have been left out. Now there is a cause for that. The reason the work has been carried on in New York State and Pennsylvania is because the counties in those States have organized, have raised funds to meet the funds of the Department, and have called for a man to carry on the work. I just came from Albany, where I had a conversation with the State Commissioner of Agriculture. He said he considered this one of the most important lines of work ever taken up with reference to agriculture. He said, "This is clinching the work which has been done by the agricultural colleges and experimental stations; it is carrying the work right out to the farm in an attempt to help the man who needs the help." Why I was surprised at his interest in the work, and I said to him: Suppose we appoint a special man in New York State, how much of his salary are you willing to pay? He said, "We will pay half the salary for such a man to take charge of this work in New York State." Now let the Vice-President of the State Board of Agriculture arrange the work of that Board so it can go out right here in Connecticut, and by co-operating with your agricultural college and the Department at Washington in getting this work started we will have right here in Connecticut a force working together.

The way this work has been started in New York State is because the railroad is putting money into it. I have several tracts with me; if any of you are interested in seeing how they read I can let you look at them. I find that the D., L., & W. Railroad, the Chambers of Commerce, the farmers' improvement associations, and the State Department of Agriculture,—representing the local interests,—have raised money to meet the appropriation which will be made by the Department of Agriculture. Now what does this man who is going there to carry on the work in a certain county do? When I got into the office at Washington I found that the man who was going out to Herkimer County, New York, was spending ten days in Washington before departure. The government has a large atlas which shows all the roads and byways in that county, and he was tracing that map. "The first thing I want to know," he said, "is every road in that county." I thought possibly he might have gotten in touch with the map furnished by the automobile association; but anyway he was studying that map. He started out to Herkimer County, and the first thing to do was to begin quietly making a study of agriculture in that county, and to get acquainted with the farmers; and if he is a wise man he is not going to offer much of an opinion at first; he is going to get acquainted, find out something about the farmers' problems, what is interesting them, what they are working at; he is going to take the attitude of getting information himself at first, and the time is going to come when that man will know more about the agriculture of Herkimer County than any other man in that county; the time is going to come when he will know more about the system of farming in that county than the men living right there in that county and doing the work on farms; the time is going to come when he is going to know more about the agriculture of every individual farm in that county than the man himself working that farm knows about it. How is that going to come about? Here is a man who has made a big success of his farm; he has done well. This man is going to make a study of that farm in relation to the other farms of the neighborhood. The man has been so busy with his own farm that he has not had a chance to study the problems of his neighbor; he has been working out his own problems. He finds out why that man has succeeded, and then imparts that information to the other farmers and tries to show them and have them meet with the success of the man who has carried it out on the other farm.

To speak of a given case: A man went to work in one of our Western States, and he found in that section a farmer who had been growing kale for twenty years and feeding it to his herds. The other farmers had their silos. This man began to investigate the problem; he found that in the growth of that kale this man had been successful, and in feeding it to his stock he had made a profit. As a result of his observations the neighboring farmers planted a small area to kale; the others began to study it, and as a result of their investigations within two years' time over 75 per cent of the silos in that county were out of business and the farmers were growing kale. It completely revolutionized agriculture in that county that had been going on for twenty years, simply by that man's going in there and making a study of it and calling the attention of the other farmers to what was being done by this successful farmer.

I was talking to a man in Pennsylvania who is especially interested in fruit growing. He has organized the farmers into a co-operative fruit-growers' association, and they investigated the market problem and found a market for their fruit. This association, through its county agent, marketed their fruit which had been produced, and one man said as a result of his work $140,000 this past year was brought into that county which would not have come into it except for this kind of work.

The Connecticut Agricultural College is ready to co-operate with the Department in this work, just as soon as funds are available. I shall be disappointed if Connecticut does not care to join in taking up this work. If the counties will supply the funds with which to meet the Department, the counties of Connecticut shall have an expert, and I will tell you that these counties in Connecticut are not going to have any second-class men; you are going to get the very best that can be had in this country. I believe the farmers will have confidence in these men, and with all these forces working together we will accomplish something for Connecticut agriculture that will be felt.

One man here said he would like to see demonstration work started with reference to keeping sheep. I think somebody ought to make a study of the sheep problem in Connecticut, not on one farm, but on the various other farms. I think that more men should be in the sheep business in Connecticut, but we don't want to advise everybody to go into the sheep business, because there isn't as much money in it as some people think there is.

This problem ought to be studied. We don't need to establish a new farm on which to study it, because we can study it on those farms where sheep are being kept. It is up to the Connecticut farmers whether they shall receive some of this appropriation which is being given by the federal government. A gentleman in charge of the fund went before the Appropriation Committee the other day to tell it about the amount of money needed from this present Congress. He was given eight minutes in which to present this subject. After he had talked for half an hour the chairman of the committee said, "I think your eight minutes are most up." (Laughter.) He was asked just one question, and that question was this: "Will the people use to advantage all of this money you are asking for?" He said, "You gave us $300,000 the last time and I have been able to get rid of most of it." That was the only question. Then after the official hearing was over nearly every member of that committee went to him and said, "If you haven't begun this work in our county we want it started there."

Now with these few words I will not take more of your time, further than to say I want to see this work started in Connecticut. (Applause.)

THE CHAIRMAN: As there are no other speakers on the program this morning we will adjourn until 1.45 p. m.

SECOND DAY — AFTERNOON SESSION.

Meeting called to order at 1.45 p. m. by Mr. Everett E. Brown.

MR. BROWN: Ladies and Gentlemen: I take pleasure in introducing Prof. John F. Graham of Amherst Agricultural College, Amherst, Mass., who will address us upon the subject of "The Business End of the Poultry Industry." (Applause.)

PROF. JOHN F. GRAHAM: Mr. Chairman, Ladies, and Gentlemen: Just a few words at the start relative to the value of the poultry upon our Connecticut farms and the comparison of that value with the value of other crops. In 1909 the total production of eggs was estimated at 8,566,000 dozens, valued at $2,476,000; the total production of poultry for that same year was estimated at 2,046,000, valued at $1,375,000; and the total value of crops in Connecticut in 1909 was $22,488,000.

The poultry business in this country stands high. What are the opportunities along the line of poultry raising? It seems to me that our advantages in this work are unlimited, especially in this section of the country. I am speaking particularly now of Massachusetts, Connecticut, Rhode Island, and the southern part of New Hampshire and Vermont, and practically New York also would come within the range; but take our three States that are situated in this particular locality here, Massachusetts, Connecticut and Rhode Island; there is no better soil anywhere than the soil conditions in these sections. I realize that in some localities we have a heavy soil that would hardly compare with the whole area of our three States here. Take the climate, I know of no States where we have a better climate for this product. We wonder why it is that the Southern States, where they have no cold winters, do not produce all the eggs they need. They don't do it. They have their drawbacks down there. I won't enter into them this afternoon, but their hot weather there the year around is conducive to the growth of lice, mites, and all kinds of disease germs. So they have their troubles along that line, as well as we have our troubles with the cold weather of this section; and then compared with the Northern States and the Middle West we have a mild climate; compared with Maine and the northern part of New Hampshire and Vermont we have a mild climate. You people are better off today than they are in some parts of western Massachusetts. There has been snow on the ground there for weeks in and about Pittsfield; so we have a climate suitable for our work. Then we have, outside of the soil and climate, the cost of building, which is not high; we have our sand here and we are nearer the lime center than they are in our Western States. The price of land ought to be considered here too. There is no comparison whatever. There are people in the Middle West, and most of the people throughout those central States are farming land that cost them all the way from one hundred to two hundred dollars per acre. It is rather amusing to me to hear people here speak of the high price of land, especially when the University of Wisconsin a year ago last October bought 170 acres of land for $1,700 an acre,—farm land near the college. It is astonishing; yet when some of our colleges can buy land at $100 or $175 an acre they think it is a pretty high price. Now I don't mean that those people can make interest on the money invested farming that land. It isn't what they are going to do with it; they are going to use it for college purposes; and I believe the people, especially the farmers of this country, have come to the conclusion that land used for school purposes is the most valuable land on the face of the earth. Another thing that I would like to mention at the present time is the different ways for the dissemination of knowledge. Years ago if a man wanted to know anything he simply went to work and dug it out for himself. Probably most of the older men here today have had to pay dearly for a great deal of the experience they have got in poultry. But at the present time,—I won't name them all,—we have our bulletins from the United States Department of Agriculture and from the various experiment stations in the different States; we have our institutes and annual meetings such as you have here; we have our extension schools that are being carried on by the agricultural colleges of the country; a bill in Congress at the present time, I believe, carries with it something like ten million dollars to carry still more easily information to the farmers. Then we have the different courses of study along the lines of farming in our agricultural colleges, and they are introducing into the rural sections county agricultural schools. The Y. M. C. A. throughout the land is also taking up the work, so it's an easy thing nowadays for a man to get hold of the information that he needs along those various lines. Then the nearness to market. Take ourselves, where is there a better market in the world than right between New York and Boston? Here is Hartford, Providence; it beats the world; I won't make any exceptions whatever; possibly Alaska. Massachusetts does not produce eggs enough for Boston. It has been said that Connecticut does not produce enough for Hartford. Surely Rhode Island can't produce the eggs for Providence. A committee went to work and investigated the average production of poultry by Massachusetts about two years ago, and from the best figures that they could gather from the buyers, sellers, and handlers Massachusetts was producing about five million dollars' worth of poultry, and something between twenty-five and thirty million dollars' worth of eggs, and I presume what is true of Massachusetts would be true of Connecticut. Perhaps you are doing better. I hope you are.

The cost of feed here is low compared with the price. I wish I had a blackboard here that I could work with, to compare the prices that we have here for poultry, eggs, and feed with those in the West. Fresh eggs have been selling in Kansas City all this winter for 22 and 24 cents a dozen. Think of it! You people have been getting all the way from 50 to 75 cents a dozen. Almost treble. A year ago this fall live chickens were selling for for 7 cents a pound in a little town near Janesville, Wis., a large farming community. I haven't had figures recently, but I presume they are selling for about the same, 7 to 8 or 9 cents a pound, live weight. Dressed chickens in the store can be obtained almost any time for 14, 16, to 18 cents. The market out there has not been specialized; that is, they do not demand the quality that the people demand here in the East. The people here are educated to it, though I do not think you and I have to go to work to educate the people to quality; they know what it is and they want it. You can sell them your best birds right along for from 28 to 30 cents a pound, when others can buy them from somebody else at from 22 to 23 cents a pound; but some of them won't take them. I am speaking of special customers,—people who are educated to the question of quality.

So much for the difference in the price of poultry. A great deal could be said about that. About ten years ago in round numbers (I am not exactly sure of the date) the average price quoted in New York City that the farmers received for eggs was 11.9 cents per dozen, and recently the estimate was 19.3 cents per dozen, so you see the price has doubled.

Now take the price of feed. I received quotations not long ago from Minneapolis by letter; I don't remember the prices of all the different grains and foods, but I do remember that bran, — good bran,— could be purchased all the way from $17 to "19 per ton. The price in freight between here and there is 27 cents a hundred. Of course the middleman gets some; true in some places he gets a lot, more than he ought to, but that is something that can possibly be regulated more or less. I won't say as to that, but I think it can be, by co-operation, but it is rather a hard proposition to talk co-operation to farmers. They don't take to it very well. Now if the freight is 27 cents, a hen consumes about 100 pounds of grain in a year; that is about what she consumes on the average. If you will take a dozen hens and feed bran and keep a record you will find that that is about what they will eat; now that being the case, we pay in freight 27 cents a year more per hen, plus the middleman's profit, which possibly would be 3 to 5 or 6 cents; then we add to it 35 cents more, which is about the average price on a dozen eggs; so you can see from that that if our hens produce a dozen eggs more than those people's in the West, compared with them, our prices are doubled; we might say there is no comparison; the people don't want Western eggs; they want the fresh eggs; and you very seldom find in the fall and winter a storekeeper who has very many fresh eggs on hand, for they go so fast. I presume that the average price of eggs in the West, as near as I can find out,—for some years at least,—has been about 33 cents. Not long ago I received a letter from a young man in Pennsylvania who ships all his eggs to New York City, and the average price of those eggs was 33.2 cents; that is from East Hampton. Another man made out a statement for the year for his flock and it averaged 33 and some tenths cents; I can't remember exactly; so it seems that, although it is drawing conclusions there is very little difference; some are doing it wholesale and others are retailing; some are catering to a good wholesale market and others are doing their best to retail their eggs and are getting the best price they can for them.

There is another thing that is working in our favor, although I think there are some who might take issue with me, and that is the cold-storage plants that have sprung up in recent years. I claim that they are a benefit to us, if handled properly. I read quite an article not long ago in which a man went on in a great tirade because of the cold-storage plants. I won't take time to go into it in detail, but I will say just a word; if it were not for the cold-storage plants, in the winter time the price of eggs would be out of sight, and people would learn to substitute other things for them and probably would get out of the habit of using them, and all that adds to the interest of the poultrymen in keeping the eggs from going too high. There are people working now on something to be used as a substitute for eggs. Personally I don't want them to do it, for I am in the chicken business.

So much then for the poultry business and the prices; and now for things that are conducive to good work here in New England. A description of the business end of poultry would not be complete without a few words in regard to the failures in the poultry business. There are failures in it, and there are failures in other lines of business, I don't know but just as many as in the poultry business. I think there are good reasons for those failures, and I think if people were to go into other lines of business as they have gone into the poultry business there would be a tremendously large number of failures too in those lines. At the present time, everybody, doctors and,—I don't know about the lawyers, have been preaching "back to the soil; get out of the crowded districts," and so the people have their faces turned toward the country; the boys are getting ready to come back; we tell them that they should have a certain amount of experience, but the young people are bound to get a certain amount of experience first; we can't stop it, so they are coming back to the country. To show you how great that is, last year we had, I think, twenty-six or twenty-seven college graduates studying agriculture so as to get back to the soil. What do they know about agriculture? They are going out onto the farm. One man said to me, "I like your work." He was a Harvard graduate. "Some of the work here is very simple, but yours is advanced work, and I like it." I was teaching him the simplest A B C about chickens: how to lift a setting hen of the nest, how to put her on, how to gather eggs, how to feed her morning and night. Advanced work! That was just as much Greek to him as mining would be to me. You can see what their minds are like. There was a girl who had been a nurse; her health was failing, and she took a course for ten weeks. I was going through this same explanation, and after the meeting was over this nurse came to me and wanted to ask certain questions about poultry. She asked, "How many times a day do you feed them?" That had all been talked over at the meeting. I said, "Usually once a day; sometimes twice. She talked with me a little while; finally I saw that she couldn't remember a single thing about it; that it was all new to her, so I asked, "You want to do this, don't you?" "Yes." "And you have plenty of money?" "No, I haven't." Then I said, "Don't do it;

go right back and go to nursing." She almost collapsed. "Why," she said, "you don't know how you disappoint me." I said, "I can't help you; you better be disappointed with your money in your pocket than to be disappointed with it outside. It is going to be that way." (Laughter.) Well I think she is nursing instead of trying to raise chickens. She knew nothing about it. I have no doubt she was bright enough perhaps in other lines, but she was ignorant about that. Another woman wrote me and asked about going into the poultry business; she had bought a farm and was getting ready, and she asked if I would name the best "brand" of chickens. I had a notion to tell her it was Swift's potted, or something like that. (Laughter.) I speak of these things to show you the class of people who go into the poultry business. I don't mean that a man can't come from the city or the town and go into the poultry business and make a success. I believe there are men who can do it,—men who have the will power and the good common sense that goes with it, the stick-to-itiveness and some little capital at least, and who know enough not to put it all into buildings and save nothing to live on; I believe that those men can do it, but they are few in number.

False advertising is another thing that is to blame for failures in the poultry business. I don't know whether I can get just what I want in a second, but I did have something here not long ago that would show you. I presume most of you know that this last year has been a poor year for fancy poultry in most of the country, and they say the great trouble has been that the advertisers have overdone it; this is what we might term as lieing about the profits in poultry. I am going to read just a little. Here is a little clipping from a paper. The man evidently wants to sell his paper, and it is a poultry paper too. He says here: "Joel M. Foster, a young man, made $19,484.33 in one year; the Curtis boys made $100,000 from chickens; Mr. Perrin" (I don't know him.) "made $1,300 in a village lot; Cornings, father and son, made $12,000; one man made over $35,000 in two years"; (he doesn't mention his name); "one man made over $13,000, and Philo made $1,600; another," (he don't say who he is) "is getting $25 a week out of six hens in a back lot." What do you think of that! Joel M. Foster is the son of his father. (Applause.) And his father is president of the Scranton, Pennsylvania, School of Correspondence, and this Ramco Farm is being run in connection with that, and also in connection with the manufacture of incubators and brooders and other poultry supplies. It is an advertising proposition. The Curtis boys, I guess that means the Curtis who is representing the Cypher Incubator Company or selling incubators and brooders; Perrin I don't know; Cornings, father and son, I understood are going into the duck business; Lakeside Farm has gone out of business; about the only thing it sold was stock to its friends; that means paper stock, like our gold and mining stock, which was bad; Philo,—I was out there this summer,—has got a tremendously large manufactory where he manufactures products like the Philo system of incubators and brooders, poultry supplies, etc.; he fishes for suckers and he gets them. I noticed the other day that he had bought a farm for $400,000; that was the report. I have no doubt that is what he paid. He is worth much over half a million dollars, and eight years ago he wasn't worth any more than I am. I am sure of that.

A VOICE: He got one dollar out of me I remember. (Laughter.)

MR. GRAHAM: Yes. Now those are the things that hurt the poultry business. They are misleading. I don't want to leave the impression here that a man can't make money out of poultry, and make good money, by going at it right, Not planning to make any such money as is mentioned here; but there are men who have started in a small way and by working in gradually are succeeding well. I just want to mention one or two of them. I don't want anyone here to think they can do as well as this man, but this man keeps 128 hens and this year his profit was $585. He lives south of Boston. That is almost $5 in profit a year on a hen. I am speaking of that because he is making a success of a few; he is not keeping thousands and thousands of hens. Another man in West Mansfield last year trap-nested 700 and he cleared $3.40 apiece. You can figure up his salary. A young man who attended our first school two years ago and took a short poultry course sent me his statement the other day and his profits on 343 White Leghorn hens were $1,100.11. He has figured taxes, interest, labor outside of his own; that is $1,100 as his salary, or we might count it as salary rather than his profits; everything has been figured in. I speak of these to show you that I think there are people who can make a good thing out of poultry, but, mind, all those people are doing it in a business way; it is not haphazard; they know exactly the line of work that is bringing them in the money.

There is another thing that makes me provoked, and that is when a man fails in any line of business except poultry they say there is something the matter with him; they say, "I always knew that fellow would never succeed; he hasn't the right kind of head on him." I don't care what business he is engaged in, it is the head they blame; but let a man fail in the poultry business and they blame the business; the man is all right; but in any other line it is not the business, it is the man. (Laughter.) So I say that it is the man in both cases,—in either case. Now why have some men succeeded and why have some failed? Is is a matter of business, I think, with those people who are doing well in the poultry industry and raising good stock. I don't mean that they are financiers, because the men I have mentioned to you are not financiers,—those three particular men,—but they are breeding good, strong, vigorous stock, carefully selected; and I would recommend most strongly the breeding of that grade of stock, and when I say this I can't get away from the standard-bred stock,— the birds that have been bred along a particular line for a number of generations,— for the reason that standard-bred stock gives us more uniformity in size, shape, and color, and the market demands that,— the ordinary market as well as the fancy market; and when I say color I don't mean the feathers alone; I mean the skin and the shanks; they are of tremendous market value. One man in choosing his birds goes out and looks here and there and finally he sees a good, orange-colored shank and he gets it. "Why," he says, "that bird has orange-colored skin, and I may get two or three cents more in the market for it than I can for the others"; so he selects that kind. Then I would breed the standard-bred stock because they give us eggs that are more uniform in size, shape, and color, and the market demands that,— uniformity in those things. Then I would breed standard-bred stock again because there is more interest in it. I couldn't have any pleasure in breeding poultry unless I had good poultry.

I want to say a few words about records. I don't see how a man can get along and make a great success of anything unless he keeps records of what he is doing. What is the value of records? First they enable a man to know what he is doing; he knows whether he is succeeding or failing or keeping even or going back or what not. (I will have to run over many of these points rapidly because I see time is going.) It is an incentive for him to do better. I know a young man who for the first five years of his married life spent every cent that he earned. He complained to his friend, and this friend said, "Why don't you keep a book and put down the value of your furniture and all the money you have in the bank?" He didn't have very much, but he said, "Well, put it down." He did it, and every six months he figured it up, and that man inside of four years had about $2,000 saved. It was an incentive; he was keeping track of where his money went, what he was doing with it; and then we want it as a matter of record for future reference; it is a basis for future operations. I don't know how a man in business unless he knows what he has done within the last year and what certain things have done for him, can plan his business for the future. He simply can't do it. I am going to give an illustration of some of those things of which a record should be kept; first, he should have labor, the cost of labor, the cost of feed. Now I think this question of labor ought to be discussed; it is an important proposition in this day in this country; it is one of the great drawbacks in our agricultural work in this section of the State, this question of work. The eight-hour law is working against us in agriculture. Our boys on the farm are not going to stay there and get up early in the morning and work till late at night when they can go to town and begin work at eight o'clock and quit at half-past four, having a half-hour's nooning. That is working against us. It seems to me that we have got to work for something along this line. I have had a young man tell me, "I am not going to keep cows because I have to get up in the morning to milk, and I have to work late at night." Another young man keeping poultry asks, "How can I succeed?" I told this man, if he makes money he has got to work. A young man got a good position. After he had been there a few weeks he came back to his mother and said, "What do you think? That fellow wanted me to work. I hired out to manage his farm." (Laughter.)

What are we going to do, gentlemen? I am serious about it. I believe it is a serious point for us to think of.

Then comes the feed, stock, equipment and the eggs, advertising and office. Those matters should be kept separate, and also the corn, oats, mash, etc., so that at the end of the year you will know how much you have used; and you want to know the price from month to month, so as to know what you pay. Just at present a man can load up on oats very cheap. He should have his income on eggs, both market and hatching; he should keep a separate record of his income for hens and pullets, cocks and cockerels, and baby chicks to know which one of those lines has been most profitable; and of course he should make a comparison of hens and pullets, and a comparison of males; that is, cockerels and old males. I cannot enter into a full description of this field as to raising cocks for breeding, etc. The best markets could be determined by the data he would get; he would know how many eggs this customer takes, how many that customer; if this is a better customer than that, he takes more eggs and is willing to pay a better price; I might cull the eggs for him and for this one and take the rest to somebody else, to the store, or some other place. That is quite an important factor.

This question of stamping eggs is a very good one. I was offered three cents a dozen more for eggs that had a little rubber stamp with "A. A. C. poultry department" on; and now I am going to stamp all the eggs we have and let the commission men handle them for me, and we are going to try it out and see just how much difference it makes. We are going to run up against this proposition: A good many people are going to get in the habit of getting those eggs, and they will say if they can't get those stamped eggs they don't want any. A good many men won't handle stamped eggs for that reason, because the people will want the marked eggs or stamped eggs, and if they can't furnish them to those customers right along they won't want them. Now I do not need to speak of the dry-goods business as to what it would do without records. I want to say just a word about railroad stocks. There was a man not long ago in a college in Massachusetts who was studying the stock market and he got to buying a little stock when he got hold of enough money for the shares. He started in and began to study years back and he got so that he could figure just about the price that particular stock would go to, unless something unforeseen happened. This enabled him to buy stocks. On these records he worked out a scheme by which he bought and sold stocks and made quite a little money out of it. I am not telling you this so that you may go out and buy railroad stocks and get rich, but it is simply to show the importance of records.

I want to speak of one farm and a man whom all of you who have poultry papers know, Mr. Owen of Vineyard Haven. I happened to be there a year ago last October and he showed me his records. His income on poultry the last year (not this last, but the year before) was $80,000. Now that is a tremendously large sum of money, and he has eight breeds of poultry, and he has figures there showing how much he has taken in for Rhode Island Reds, Barred Rocks, White Leghorns, Black Leghorns, etc. He knows how much the pullets have brought him in as well as the the hens, the cocks and cockerels, and by the business that he did the year before he knows how much per cent increase there was for this year's business, and so on. If he wanted to know how many of a particular breed he had sold he could turn to his record and find out; and when he showed me those figures of how much he had made from the different varieties and so on it made me think of the great importance of figures and records, that they are of tremendously great value.

Now how shall these be kept? I haven't time to enter into that either; you have the loose-card system and the loose-leaf system and just the ordinary books. I am going to leave it to you to figure out which you shall use; and if I can induce anybody here to keep absolute records, say half a dozen people, I shall feel that my time has been well spent.

I wanted to say quite a little about marketing the eggs and poultry, but I see our time is just about gone. You all know, I believe, that the report of the United States government has shown there has been a loss of about forty-five million dollars in marketing eggs annually in the last two or three years. As you know, eggs are not placed upon the market as simply spoiled eggs; they go something like this: heated eggs, shrunken eggs, rots, cracks, and brokens. Now about forty-five or fifty million dollars are lost annually by not caring for the eggs properly. I want to say to you just here that if all the eggs produced in the United States were as large as the largest eggs, the average value would be increased from twenty-five to thirty-five million dollars, or even more; so the size should cut more figure than it does now. If more care was used in preparing the eggs for market and getting them before the customer in the right kind of shape I believe we could add twenty-five to thirty million dollars.

It is needless to say that the nests should be kept clean, the houses should be kept clean. I am not here to say that a man should clean out his poultry house every day, but I do want to say that he should keep it smelling right. That is essential. Eggs take on odors the same as butter; and I can assure you that I do not like to have my wife take eggs from a dirty nest and hold them over the frying pan and break them, or hold them over the egg dish and break them. Perhaps no housewife should ever do that. They should be broken in a saucer that will hold them; but I don't care how you break them, if there is anything on them, whatever you hold them over, it is not going to fall in the right place. (Laughter.) So I like to think that the egg when broken is clean and not dirty. One day a man gathered half a dozen White Leghorn eggs that were clean, and also another half dozen of those dirty eggs and placed them on a shelf beside the others,—the clean eggs,—and in six weeks he had six eggs with spots or mold in them and the other six were perfectly good; that is, they would be called shrunken eggs, but they were not spoiled or had no bad odor, showing that mold and dirt had affected those eggs, and the mold had gone through the shell.

The marketing of eggs is quite an important factor. I think the time is coming when we will not sell eggs to hucksters; I think the time is coming when we will sell our eggs on guaranty, and we will get a good price for them. I am not surprised that many will not give a high price for good eggs; they say the cold-storage eggs are about as good. Many of us know that in the country they hold eggs that were laid in the latter part of the summer or in the early fall and put them with fresh eggs. I bought some eggs from a reliable man and paid him three cents more than he asked, giving him the extra change to make sure of getting fine eggs. I got only half a dozen, and four of those eggs were absolutely rotten. They were not bad or stale, they were rotten. (Laughter.) They had not been in a hen for three months I am sure. (Laughter.) And so I believe we talk a good deal about the dishonesty of the dealer, but I think there is a word that could be passed out to some of us who are producers. I know there is a tendency to keep our eggs when they are cheap.

If we keep those eggs we should sell them for just exactly what they are and not call them strictly fresh eggs. Let us help each other.

I am not going to say whether it is best to cater to private trade, to hotels, restaurants, and drug stores,— places of that kind. I think there are men who can do that; if they are situated so they can that is the thing to do, if they can get a good price. If the eggs are handled by commission men who are dealing extensively and selling to hotels and restaurants there is no way of finding out if so many eggs are broken, so many spoiled, this, that, and the other thing. I sold a case of eggs to a man and he shipped them to Boston and the purchaser kept them till the next day. When this man came to get his pay the Boston man said, "Why I don't want those eggs." "Why?" "Because I broke one or two and they were off." "All right, I will take them back." "Of course," he said, "we can't handle them as A No. 1 eggs." He thought in that way he could get those eggs five cents a dozen cheaper. So much for the trade.

Co-operative methods. I am going to say but one word about them, and that is this: There are some people in the country who make a success of them. There is a co-operative association at Ulysses, Pa., which was formed by the young man who wrote about his 343 Leghorn hens that made him $1,100 last year, —a stock company at $5 a share. These people have rented a room and the eggs are gathered together and sorted; they are going to have a station, and I believe it is going to work. The creameries as centers for gathering eggs have been successful in Minnesota. In the Netherlands, Holland, the butter and eggs are gathered together and shipped to London, and there are five thousand people who are handling these products in that way, getting their shipping rates through this association and marketing the products.

Now the things that affect market eggs and I am done. First, unsanitary conditions. I am not going to stop to go into details, but will simply mention them: eggs held too long, males in pens, especially when the weather is warm; eggs kept in warm rooms, rations, dirt, size of eggs, shape, and color.

I want to say in closing that I believe this question of the business side of the poultry industry depends upon the man, just as in other lines of work,—depends almost entirely upon the man.

People going into the poultry business are not quite as wise as the man I heard of in Milwaukee. His name is Hans. It seems that in the breweries in Germany and a few of the breweries in this country where the men have come over from Europe they let them drink all they want. Some one asked Mr. Pabst how they can let the men drink all they want and yet they do not get drunk. Mr. Pabst said, "We have no trouble at all; we get along very nicely." He said, "I have a man here who can drink a pail of beer." The man said he would like to see him, so Mr. Pabst turned to his foreman and said, "Tell Hans to come up." Hans came up and Mr. Pabst said, "I have been telling this man that you can drink a pail of beer, and I would like to have you show the gentleman that you can do so." Hans said, "All right," so he went out, and in a few minutes he returned with a pail of beer and lifted it up to his mouth and the beer disappeared. The man said, "How did you know you could drink that pail of beer?" Hans said, "I wanted to make sure before I came before Mr. Pabst and his friends, so I just tried one pailful before I came up." (Laughter and applause.)

The Chairman: If anyone wishes to ask Professor Graham any questions he will answer them.

He spoke of the ignorance of some of those people who have attended these short courses, as to the poultry business. I heard a while ago something pretty good along that line about a young lady who was very much interested in chickens. A friend of hers gave her a setting of eggs and loaned her a hen to do the hatching business, and after a while she telephoned that the chickens had come and they were doing very well. Two or three days later she called her up about the chickens and said they were not doing very well, so she went over. The chickens were standing around humped up, so she asked the question, "What have you fed them?" "Fed them?" said she; "I didn't suppose they needed it; I thought the old hen would give enough milk for them." (Laughter.) If you have no questions to ask Professor Graham I believe this is the last thing on the program and we will close.

Mr. Duffy: I am a dairyman and am very much interested in dairy work. It is expected that the next secretary of agriculture will be in opposition to the oleomargarine tax of ten cents per pound on colored oleo. If he is secretary of agriculture he will probably have a great deal to say about it. We know that the oleo dealers are going to make a fight, and it seems that the agricultural associations of every State ought to get ready for the question. Therefore I have a resolution to offer: "We, the members of the Connecticut State Board of Agriculture, in annual convention assembled, do protest against any change in the present oleomargarine law reducing the present tax on colored oleomargarine." I would offer that before we stop.

Mr. ———: I will support that resolution.

THE CHAIRMAN: It is before the house. Does anyone wish to remark?

MR. POTTER: I am very much pleased that Mr. Duffy has brought this question before this organization. It is a question that needs the attention of the dairymen throughout the country. If this present law is repealed and a new one enacted nobody knows what that new law will be. It may be possible to amend the old law, but it is a very dangerous proposition, and I very much hope that this organization will vote against any repeal of the present oleomargarine law. I know that if the tax is taken off colored oleo there will be an awful lot of it sold for butter, in spite of all the pure-food department can do. At the present time there are about four hundred licensed oleo dealers in Connecticut. Five years ago there were less than thirty, and this was brought about by the high price of butter. If the tax is taken off colored oleo and it is distributed throughout the country it will be almost impossible to stop the sale of oleo as butter.

THE CHAIRMAN: Mr. Potter, from his experience as Dairy Commissioner, is well qualified to speak on this subject, and I haven't any doubt but what the audience is in sympathy with him. Any further remarks?

Motion put by chairman and carried.

MR. DUFFY: I would move that the secretary be instructed to forward a copy of this resolution to each member of Congress and to each of the Senators of the State of Connecticut. This ought to have gone with the resolution.

Motion seconded; put by the chairman and carried.

MR. DUFFY: I have two or three poultry questions. The other evening I was present at a discussion of the poultry business in Hartford, where this Storrs contest was spoken of. One man was talking of the value of Orpingtons and another was agitating the value of Leghorns. It was stated that the Leghorn weighs only just about one half what the Orpington does, standard; consequently if the law that holds good in all other lines of live stock is true in regard to poultry (they didn't seem to know whether it held good or not) you would be able to keep Leghorns for about one half what you can keep Orpingtons for.

THE CHAIRMAN: Oh yes, the no question but what the lighter would cost less to keep.

MR. DUFFY: White Leghorns?

THE CHAIRMAN: Yes.

PROFESSOR CLINTON: When the Storrs contest is finished the data will be published; there will be data in the bulletins from Storrs.

Mr. ———: Can't you give a little information as to the general work?

Professor Clinton: I am not certain that it will be possible to give that data today. Mr. Kirkpatrick is here, but I doubt if he is able to give any information. I know that he doesn't carry those figures around with him.

The Chairman: We should be glad to hear from Mr. Kirkpatrick.

Mr. Kirkpatrick: Professor Clinton has guessed right. I did have a number of people come for the record of how much the Rhode Island Reds had consumed on the avarage this last year. They ate about two thousand pounds of mash and about seventy-five pounds of grain; that is about all the definite data I can give you. I think our record will no doubt show a less consumption of feed by pure-bred Leghorns than by the Orpingtons, but there won't be a great deal less. I think we ought to remember in this connection that the Leghorn lays an egg that is about as big as the Orpington egg, so that what the Leghorn loses in size, it seems to me, is perhaps made up in activity; and the Leghorn will probably consume less, although not a very great deal less.

The Chairman: Of course there is another consideration in connection with this: I think it is universally admitted that the Leghorn hen occupies a position in the poultry world similar to that occupied by the Jersey in the dairy world. If the Leghorn hen is laying a certain number of eggs, in order to get some extra dozens of eggs you would have to give extra feed; but for the same amount of production I don't thing there is any doubt but what the Leghorn will lay a certain number of eggs for a little less feed than the heavier breeds. There is one thing: Mr. Kirkpatrick's figures are very close to Professor Graham's. Professor Graham gave the figures as about 100 pounds per year per hen and Professor Kirkpatrick told us 95, so you see they are pretty close to each other.

Mr. Kirkpatrick: It may be interesting for me to add in this connection that the average of the Rhode Island Reds was nearly 160, 159 and a fraction eggs, which I think you will agree is a fairly decent good year for hens.

Mr. ———: Do you happen to remember the average of the Leghorn eggs?

Mr. Kirkpatrick: I can't give you that average.

Mr. ————: I want to ask Mr. Kirkpatrick. I think he stated that the Rhode Island Reds consumed about 95 pounds, and have the idea that the Leghorns consume nearly as much; that is the impression that I got from information that I have of this contest.

Mr. Kirkpatrick: As I said, I can't answer that definitely, for I can't carry those figures in my head. I think the records will show that the average consumption is a little less for the Leghorns, but, as I said a moment ago, I don't think it will show that it is a great deal less.

Mr. Chairman: I think, as some of us have to take the train and it is nearly time for it, I will declare the meeting adjourned.

OFFICIAL LIST OF SOCIETIES HOLDING FAIRS IN 1912.

Name of Society	President	Secretary	Treasurer
Berlin	C. M. Jarvis	L. W. Gwatkin	Bryan H. Atwater
Beacon Valley	E. P. O'Brien	E. I. Ahern	W. T. Davis
Conn. Fair Association	J. L. Dower	G. C. Eno	W. M. Goodwin
Conn. Dairymen's Association	G. W. Davis	J. G. Schwink	R. E. Buell
Conn. Pomological Society	J. N. Barnes	H. C. C. Miles	Allen B. Cook
Conn. Hort. Society	I. A. Webber	G. W. Smith	W. W. Hunt
Conn. Bee Keepers' Association	Allen Latham	J. A. Smith	Edgar W. Lewis
Chester	Theodore Foster	W. P. Holden	Belle L. Strong
Colchester	F. H. Browning	C. E. Staples	James A. Smith
East Haddam	S. R. Bailey	G. E. Wilkes	William F. Palmer
Granby	G. O. Beach	Charles Allshouse	H. G. Viets
Goshen	E. O. Wright	E. H. Johnson	Edward H. Johnson
Guilford	William T. Foote	R. DeF. Bristol	W. C. White
Horseshoe Park	A. C. Williams	S. B. Harvey	Samuel B. Harvey
Haddam Neck	E. W. Crocker	G. M. Smith	W. B. Lonnberg
Harwinton	F. A. Cleveland	W. F. Balch	D. K. Bentley
Lyme Grange	R. L. Harding	J. W. Stark	H. B. Sisson
New Haven County Hort. Society	A. D. Lathrop	C. D. Greenman	Charles W. Hill
New London County Hort. Society	James Kydd	David Wyllie	
New London County	S. A. Gilbert	F. N. Allen	George H. Stone
Norfolk	S. P. Humphrey	W. A. Spaulding, Jr.	David Kidd
North Stonington	C. H. Brown	C. P. Kendall	Edmond Brown
Orange	Walter S. Hine	I. A. Andrews	Bella M. Alling
Rockville Fair Association	O. A. Leonard	H. C. Smith	W. H. Yost
Stafford Springs	W. H. Hall	C. F. Beckwith	George Siswick
Suffield	G. S. Phelps	J. P. Graham	James O. Haskins
Union	E. S. Fuller	E. W. Avery	Charles A. Thompson
Union Society of Barkhamsted, Colebrook and Hartland	T. C. Barnes	H. P. Deming	F. W. Moore
Windham County	G. S. Carey	J. B. Stetson	William R. Thurber
Woodstock	H. O. Preston	L. H. Healey	M. Riddick
Wolcott	W. A. Faber	W. V. Warner	E. E. M. Upson
Washington	D. S. Hartwell	C. E. Hough	C. P. Farrand

RETURNS OF AGRICULTURAL SOCIETIES, 1912.—FINANCES.

SOCIETIES	CASH ON HAND	SINGLE ADMISSION TICKETS	MEMBERSHIP OR SEASON TICKETS	GRAND STAND	ENTRANCE FEES, TRIALS OF SPEED	OTHER ENTRANCE FEES	RENT OF GROUNDS	OTHER SOURCES	STATE APPROPRIATIONS	DONATIONS AND UNCLAIMED PREMIUMS	TOTAL
Berlin	$ 156.59	$ 8,668.50	$ 2,022.00	$ 564.00	$ 1,184.00	$ 586.65	$ 1,358.06	$ 192.04	$ 1,516.88		$17,042.72
Beacon Valley	414.00	1,175.30		45.00	97.50	20.75	213.00	63.70	198.40	$ 5.00	2,232.65
Connecticut Fair Association	110.09	21,751.20		4,761.00	13,377.00	529.00	11,772.50	2,578.58	209.28	200.00	75,089.15
Connecticut Dairymen's Association											
Connecticut Pomological Society											
Connecticut Horticultural Society											
Connecticut Bee Keepers' Association											
Chester		63.30	20.75				20.50	114.39	198.40		417.34
Colchester		87.00			10.00			96.11	100.00	37.00	330.71
East Haddam	40.00	234.75					35.00	360.98	100.00	11.00	681.75
Granby	7.06	895.15					150.00	185.67	168.40	93.60	1,529.88
Goshen		397.65	92.50		60.00		256.25	226.40	198.40		1,231.20
Guilford	349.52	333.46	164.50			20.80		120.74	198.40	63.42	1,250.84
Horseshoe Park		2,884.00		454.50	2,665.00	57.60	286.85	236.00	198.40	15.00	6,797.35
Haddam Neck		119.20					5.00	570.75	198.40		893.35
Harwinton	64.99		1.25			23.00	371.30	207.60	198.40		866.54
Lyme Grange	95.72	354.15					53.00	217.54	198.40		918.81
New London County Hort. Society		23.35	97.00						104.19		224.54
New London County	1,197.46	2,641.40	68.00	519.25	742.50	650.00	623.00	843.10	198.40		6,839.61
New Haven County Hort. Society	383.61	102.00	57.00					58.09	198.40	193 00	992.10
Norfolk	485.05	485.30	138.50			850.00	42.50	217.70	166.48	91.10	1,635.43
North Stonington	309.29	2,000.00					85.00	793.81		54.80	3,242.90
Orange	1,025.00	153.85	63.00	33.45	90.00	10.00	10.00		198.40	10.00	1,593.40
Rockville	107.60	5,127.65	248.00	1,302.75	1,198.50	99.20	1,557.95	61.00	198.40		9,901.05
Stafford Springs	189.17	4,184.45	580.00	1,202.50	897.00		915.50	455.25	198.40		8,622.17
Suffield	66.89	3,146.45		353.25	1,542.00		459.00	2,001.70	198.40		7,767.69
Union (of Somers)	693.67		13.00				86.00	114.96	198.40	37.00	1,142.13
Union Society of Barkhamsted, Colebrook and Hartland	32.25	502.50	50.50				147.09	200.00	198.40	.60	1,131.34
Windham County	230.86	1,330.48	20.00	200.50	75.00	96.01	347.00	130.77	198.40	65.00	2,694.02
Washington		336.45	170.00				82.00	52.00		258.00	898.45
Woodstock	199.37	1,714.15	118.00	341.50	102.00	82.00	245.25	524.63	198.40		3,525.30
Wolcott	1,057.08	363.35	68.00			10.50	96.00	166.56	198.40		1,975.77

RETURNS OF AGRICULTURAL SOCIETIES, 1912.—FINANCES, *Continued.*

SOCIETIES	EXPENSES OF FAIR	PREMIUMS FOR SPEED	PREMIUMS FOR AMUSE'TS	OTHER PREMIUMS	PERMAN'T IMPROVE-MENTS	OTHER EXPENSES	CASH ON HAND	INDEBTED-NESS OF SOCIETY	REAL ESTATE	PERSONAL PROPERTY	NO. OF MEMBERS	NO. OF STOCKH'RS	CAPITAL STOCK	ADMISSION TICKETS	SEASON TICKETS	GRAND STAND
Berlin	$15,805.23	$ 2,814.20	$ 758.85	$ 4,295 81	$ 563.92	$ 7,372.45	$ 1,237.49	$20,340.00	$25,080.22	.....	1900	....	.....	.50	1.50	.25
Beacon Valley	781.55	347.50	60.00	303.00	65.95	.....	674.65	.....	25.00	.....	25	....	.....	.35	....	.25
Conn. Fair Ass'n	29,942.16	15,632.50	3,654.92	6,737.75	5,754.39	12,449.47	918.26	1,102.70	170,298.04	$ 8,482.31	....	34	115,500.00	.25-.50	....	.50-$1
Conn. Dairymen's Ass'n	2,836.66	.....	.....	698.00	.....	1,495.39	647.77	.....	.....	.....	....	....	.....	.....	....	.....
Conn. Pom. Society	121.50	.....	.....	516.80	.....	.....	179.25	.....	.....	.....	936	....	.....	.....	....	.....
Conn. Hort. Society	233.17	.....	.....	.....	.....	187.17	95.52	.....	.....	1,245.00	206	....	.....	.10	....	.....
Conn. Bee Keepers' Ass'n	79.83	.....	.....	504.50	.....	.....	16.77	200.00	.....	.....	142	....	.....	.....	....	.....
Chester	166.45	.....	.....	195.95	.....	.....	.....	3.11	.....	125.00	83	....	.....	.25	....	.25
Colchester	110.85	.....	.....	103.25	.....	.....	119.26	625.00	.....	3,000.00	75	74	.....	.25	....	.....
East Haddam	438.31	.....	29.50	232.10	40.00	.....	173.92	.....	1,100.00	400.00	230	....	.....	.10-.25	....	.....
Granby	488.62	266.25	.....	247.80	166.08	10.00	.....	1,000.00	.....	3,000.00	90	....	.....	.35	....	.....
Goshen	501.44	322.00	44.15	284.70	.....	50.00	28.91	.....	50.00	.....	37	....	.....	.15-.25	....	.....
Guilford	421.27	.....	.....	526.12	17.50	12.56	273.39	.....	.....	.....	329	....	.....	.35	.50	.....
Horseshoe Park	6,865.95	4,200.00	628.00	1,200.00	75.00	1,061.81	363.43	2,159.88	.....	4,600.00	....	49	5,000.00	.25-.50	....	.50
Haddam Neck	478.05	.....	40.00	117.25	246.73	.....	.....	800.00	2,100.00	75.00	....	29	1,325.00	.25	....	.....
Harwington	196.68	.....	94.36	322.70	126.47	154.38	.....	328.04	1,738.97	140.00	185	....	.....	.....	....	.....
Lyme Grange	79.04	.....	50.00	182.00	289.77	206.49	111.01	.....	.....	.....	98	....	.....	.25	....	.....
New London Co. Hort. Society	30.10	.....	.....	103.50	.....	77.08	13.86	.....	.....	35.00	107	....	.....	.15	....	.....
New London Co.	1,447.20	1,600.00	867.00	1,031.65	486.50	1,407.26	.....	2,700.00	1,000.00	.....	170	....	.....	.35	1.00	.25
New Haven Co. Hort. Society	235.50	.....	.....	236.75	.....	137.69	382.16	.....	.....	.....	76	....	.....	.25	....	.....
Norfolk	892.14	.....	.....	508.65	.....	119.77	114.87	.....	.....	.....	175	....	.....	.25	....	.....
North Stonington	1,124.47	.....	.....	1,037.30	337.69	692.29	51.15	.....	.....	.....	....	....	.....	.25	....	.....
Orange	2,010.00	450.00	125.00	.....	300.00	.....	.....	1,500.00	1,500.00	.....	63	....	.....	.50	....	.25
Rockville Fair As'n	.....	2,432.96	1,579.05	1,342.50	350.00	2,107.04	2,089.50	1,800.00	7,000.00	.....	....	143	10,000.00	.50	....	.25
Stafford Springs	2,460.96	1,965.00	1,834.35	1,037.90	589.35	135.50	599.11	1,000.00	1,000.00	.....	52	....	5,000.00	.50	1.00	.25
Suffield	7,435.40	2,700.00	383.40	796.00	1,315.00	2,241.00	332.29	3,000.00	9,000.00	200.00	....	392	3,210.00	.50	....	.25
Union	100.48	.....	58.50	256.65	.....	124.50	602.00	.....	.....	.....	364	....	.....	.....	....	.....
Union Soc. of B., C. and Hartland	300.31	.....	25.00	514.00	150.00	100.00	42.03	200.00	.....	250.00	101	....	.....	.10-.25	....	.....
Windham County	402.52	305.00	280.00	1,053.50	296.08	136.81	220.11	.....	2,500.00	100.00	550	....	.....	.35	1.00	.25
Woodstock	.....	324.00	233.50	1,208.00	602.79	939.30	99.73	.....	8,000.00	1,970.00	500	....	.....	.25-.35	1.00	.25
Wolcott	459.79	.....	.....	398.25	75.26	4.50	1,032.97	.....	3,000.00	100.00	43	....	.....	.25	1.00	.10
Washington	357.92	.....	18.00	.....	211.15	.....	311.38	.....	.....	.....	34	....	.....	.15-.25	....	.....

ANALYSIS OF PREMIUMS AND GRATUITIES PAID.—FARM STOCK.

SOCIETIES	BULLS	MILCH COWS	HEIFERS AND CALVES	WORKING OXEN	STEERS	FAT CATTLE	HORSES	SHEEP	SWINE	POULTRY	ALL OTHER STOCK	TOTAL
Berlin	$229.00	$452.00	129.50	$638.50	$110.00	$25.00	$92.50	$295.00	$ 35.00	$692.00	$355.00	$ 3,520.50
Beacon Valley	5.75	10.25	23.00	9.00	1.00	......	11.50	......	4.00	62.25	49.75	524.00
Connecticut Fair Association	459.00	1,930.00	584.00	......	......	......	......	349.00	276.50	......	......	46,632.00
Connecticut Dairymen's Society	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Pomological Society	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Horticultural Society	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Bee Keepers' Association	......	......	......	......	......	......	......	......	......	......	......	......
Chester	1.00	4.50	7.00	6.50	4.25	......	10.50	......	10.00	29.75	.70	74.20
Colchester	1.45	3.75	1.30	10.50	3.60	......	8.25	1.00	......	7.25	......	37.10
East Haddam	3.60	2.70	2.20	73.50	1.50	......	17.25	18.00	5.00	2.00	2.00	127.75
Granby	10.00	50.00	13.25	31.50	10.00	......	32.00	4.00	......	21.50	......	172.25
Goshen	11.50	43.00	10.05	65.00	10.00	......	24.00	......	......	32.50	......	196.05
Guilford	4.00	12.00	3.50	45.50	7.00	......	25.00	5.00	7.00	73.12	37.00	219.12
Horseshoe Park	91.00	108.00	332.50	65.00	48.00	......	46.00	146.00	29.00	114.25	......	979.75
Haddam Neck	2.00	3.00	5.00	39.00	35.00	......	3.00	......	......	2.00	.50	89.75
Harwinton	4.50	14.60	5.85	48.25	26.50	......	12.25	1.50	2.00	41.50	6.10	163.05
Lyme Grange	1.50	2.50	3.00	45.00	51.00	5.00	13.00	2.50	......	7.50	5.50	136.50
New London County	63.50	221.75	123.00	78.50	15.25	17.50	76.25	120.50	34.50	101.50	......	852.25
Norfolk	9.00	28.00	27.00	21.00	4.00	......	52.00	......	13.00	58.00	6.50	218.50
North Stonington Grange	21.60	173.75	19.10	58.83	34.30	......	119.70	13.70	21.70	99.30	66.65	628.60
Orange	12.00	73.00	33.00	93.00	19.00	7.00	81.00	3.50	......	21.00	1.75	344.25
Rockville	53.00	75.00	173.00	58.00	20.00	5.00	65.00	11.00	16.00	307.05	......	783.05
Stafford Springs	36.00	135.00	74.00	234.00	21.00	9.00	64.00	8.00	......	......	6.00	552.00
Suffield	49.00	108.00	74.00	......	......	......	63.00	......	......	262.00	......	556.00
Union	12.50	58.00	21.00	14.00	16.25	......	27.50	......	7.00	29.50	3.00	188.75
Union Society of Barkhamsted, Co'k and H'd.	29.00	37.00	45.00	10.00	8.00	......	62.00	25.00	......	32.20	......	248.20
Washington	12.00	26.00	10.00	15.00	31.00	......	38.00	5.00	3.00	7.00	6.00	153.00
Windham County	48.00	72.00	103.00	81.00	48.50	......	126.00	30.00	4.00	34.25	......	922.25
Woodstock						......	115.00		29.00	84.00	......	525.00
Wolcott	14.00	37.00	15.25	80.00	......	1.00	33.00	......	......	23.00	......	203.25

ANALYSIS OF PREMIUMS AND GRATUITIES PAID.—*Continued.* FARM PRODUCTS.

SOCIETIES	CORN	GRAIN	POTATOES	OTHER CROPS AND VEGETABLES	TOTOL
Berlin	$ 43.00	$11.00	$ 45.00	$215.00	$ 314.00
Beacon Valley	1.25	2.00	4.50	13.00	20.75
Connecticut Fair Association	434.25	10.50	124.25	487.00	1,056.00
Connecticut Pomological Association					
Connecticut Horticultural Society				25.00	25.00
Connecticut Bee Keepers' Society					
Chester	1.50	.60	5.50	22.65	30.25
Colchester	1.50	.50	1.50	5.55	9.05
East Haddam					72.30
Granby	2.50		3.50	17.70	23.70
Goshen			4.75	8.25	13.00
Guilford	12.25		6.00	31.90	50.15
Horseshoe Park	16.50	9.00	12.25	80.25	118.00
Haddam Neck	1.50	.50	.75	5.00	7.25
Harwinton	8.00	3.85	5.50	24.85	42.20
Lyme Grange		2.25		17.25	19.50
New London Horticultural Society					
New London County	2.50	.75	.75	62.25	66.25
New Haven County Horticultural Society					
Norfolk	37.25	1.25	17.50	26.20	82.20
North Stonington	14.50	2.75	19.75	125.30	162.30
Orange	16.50	7.50	4.25	82.00	110.25
Rockville Fair Association	3.00	89.00	23.50		115.50
Stafford Springs	27.60	12.50	71.30	106.40	217.80
Suffield	12.00		12.50	41.75	76.25
Union	2.50	1.00	5.75	17.25	26.50
Union Society of Barkhamsted, Colebrook and Hartland	20.50	1.50	22.20	51.15	95.35
Washington	3.50	2.00	2.00	8.25	15.75
Windham County	5.00	3.25	23.25	31.45	62.95
Woodstock					107.10
Wolcott	15.75	2.00	10.75	47.50	76.00

ANALYSIS OF PREMIUMS AND GRATUITIES PAID.—*Con.* FARM PRODUCTS AND MISCELLANEOUS.

SOCIETIES	FRUITS	FLOWERS	OTHER CULTIV'D CROPS	BUTTER	CHEESE	HONEY	BREAD AND CAKE	PRESERV'D FRUITS	TOTAL FARM PRODUCTS	AGRIC'L IMPLEM'TS	MECHANI'L INVEN-TIONS	FINE ARTS	DECORAT'D CARTS AND OX TRAINS	PLOWING	GRANGE	MEDALS	DIPLOMAS	TOTAL MISCELLA-NEOUS.
Berlin	$183.50	$98.25		$37.00	$ 1.00	$99.00	$28.50	$50.25	$ 311.50		157.00	$32.75	$50.00		$31.00	$22.00	$15.00	$457.75
Beacon Valley	23.00	9.25		.75	.50		15.00	4.25	73.50		5.75	9.25	38.00					53.00
Conn. Fair Association	444.25	608.00				200.00	63.50	48.25	2,420.00			617.25					4.00	617.25
Conn. Dairymen's Association				698.00					698.00									
Conn. Pomological Society	516.80								516.80									
Conn. Horticultural Society	3.00	131.75	$25.00						159.75									
Conn. Bee Keepers' Associat'n						504.50												
Chester	10.05	17.00					6.80	13.10	77.20									
Colchester	2.50	6.45	8.95	.75		.25	2.40	4.50	25.80			28.80	2.50					31.30
East Haddam	.60	3.75	72.30		1.80				78.45			6.00	19.90					25.90
Granby	30.00	10.85							64.55			11.00						11.00
Goshen	5.50	10.00					2.10	6.00	23.60	8.00		12.05	32.00					52.05
Guilford	37.70	10.75	2.95	2.25		.40	12.70	6.05	122.95			59.55	124.50					184.05
Horseshoe Park	76.25	8.00	6.00			1.00	4.00	7.00	220.25									
Haddam Neck	2.00	1.50		.50		.50	3.50	2.00	25.00		.50	2.00						2.50
Harwinton	19.05	4.50		.50	.20	1.00	10.70	3.05	39.00		6.00	12.45	40.00		20.00			78.45
Lyme Grange	5.25	4.50							9.75			16.50						16.50
New London Co. Hort. Society	100.00		3.00						103.00									
New London County	4.90	9.25					7.00	2.25	23.40	6.00	14.00	69.75						89.75
New Haven Co. Hort. Society																2.00	4.00	50.00
Norfolk	30.55	24.00		3.00	2.50	12.00	9.45	34.45	115.95			25.75				87.50		25.75
Orange	65.50	5.50					19.75	5.00	95.75			26.75	497.00					523.75
North Stonington	15.40	28.84		3.36		6.65	33.36	17.92	267.83		20.52	120.35						140.87
Rockville Fair Association	79.75	17.00		3.00		1.50	13.50	2.00	116.75			299.20	30.00					329.20
Stafford Springs	72.00	3.75	2.00	3.50			14.45	12.00	108.60			113.40	25.00				6.00	138.40
Suffield	42.00	6.00				8.25			56.25			107.50						107.50
Union					3.50	5.00	12.40	24.80	103.20		9.00	43.25	15.00					67.25
Union Society of Barkhamsted, Colebrook and Hartland	5.00	3.00	.50				2.65	1.50	12.65	5.00	12.00	11.75						28.75
Windham County	39.55	24.75	4.30	2.25	2.50	1.00	30.65	22.00	139.75	35.	59.65	168.65			75.00			338.30
Woodstock	58.60	48.30		11.50	42.85				161.25		56.20	223.45	125.00					404.65
Washington	20.25	3.00	11.50	1.50			6.50	4.00	46.75			24.25	23.00		25.00			72.25
Wolcott	19.50	3.50				2.00	1.40	3.00	39.40			8.00	5.00					13.00

NUMBER OF ANIMALS EXHIBITED — 1912

SOCIETIES	BULLS	MILCH COWS	HEIFERS	CALVES	WORKING OXEN	STEERS	FAT CATTLE	HORSES	HORSES — SPEED	SHEEP	SWINE	POULTRY	ALL OTHER STOCK
Berlin	38	142	84	......	236	44	12	68	40	74	20	1,115	......
*Beacon Valley	......	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Fair Association	42	91	120	21	......	......	......	......	......	40	......	632	......
Connecticut Dairymen's Society	......	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Pomological Society	......	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Horticultural Society	......	......	......	......	......	......	......	......	......	......	......	......	......
Connecticut Bee Keepers' Association	......	......	......	......	......	......	......	......	......	......	......	......	......
Chester	1	6	10	4	12	10	......	6	......	......	5	30	3
Colchester	2	5	5	......	16	16	......	9	......	6	......	32	......
East Haddam	4	11	4	......	294	2	......	16	......	75	12	8	......
Granby	7	61	17	......	20	14	......	26	......	7	......	68	......
Goshen	12	34	15	......	42	22	......	18	12	......	......	78	......
Guilford	6	15	5	......	70	20	......	18	......	6	23	280	50
Horseshoe Park	28	42	107	......	86	52	......	23	56	103	43	178	......
Haddam Neck	1	9	8	3	108	86	......	10	......	......	......	18	4
Harwinton	5	8	10	4	46	38	......	18	......	7	12	128	24
Lyme Grange	3	10	3	2	80	158	4	9	......	4	......	100	......
New London County	37	159	90	12	72	36	9	24	......	72	32	482	......
Norfolk	4	12	20	1	22	4	......	23	......	......	4	46	......
North Stonington Grange	7	67	15	......	12	32	......	37	......	14	15	188	59
Orange	11	50	26	104	64	8	......	41	......	4	......	138	......
Rockville	......	......	......	......	......	......	......	......	......	......	......	......	......
Stafford Springs	13	35	25	5	80	16	4	22	......	......	......	......	......
Suffield	13	66	53	......	20	......	......	......	......	......	......	810	......
Union	8	29	24	......	8	22	......	25	......	......	18	80	60
Union Society of Barkhamsted, Colebrook and Hartland	8	17	20	5	12	8	......	43	......	......	33	120	......
Washington	14	42	40	1	14	64	......	62	......	21	8	56	22
Windham County	35	72	100	10	80	68	......	39	......	73	9	182	......
Woodstock	9	60	25	16	7	10	......	40	15	12	12	225	......
Wolcott	7	30	9	......	30	......	1	11	......	......	......	50	......

* Secretary did not furnish material to fill this blank.

AGRICULTURAL FAIRS IN CONNECTICUT, 1912.

SOCIETIES	PLACE	DATE	ATTENDANCE						
			Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
Berlin	Berlin	September 24–27	......	3,500	9,000	8,000	1,200	......	21,700
Beacon Valley	Beacon Valley	October 15	......	4,000		......	......	......	4,000
Conn. Fair Association	Charter Oak Park	September 2–7	8,256	3,232	10,657	19.907	10,216	......	55,422
Conn. Dairymen's Association	Hartford	January	......	......	......	......	......	......	.....
Conn. Pomological Society	Berlin	September 24–27	......	......	......	......	......	......	.....
Conn. Horticultural Society	Hartford	September 19–20	......	......	......	300	850	......	1,150
Conn. Bee Keepers' Association	Charter Oak Park	September 2–7	......	......	......	......	......	......	.....
Chester	Chester	September 17	......	......	......	......	......	......	500
Colchester	Colchester	October 3	......	......	......	......	......	......	500
East Haddam	East Haddam	September 11	......	......	......	......	......	......	1,400
Granby	Granby	September 26–27	......	......	......	3,000	1,000	......	4,000
Goshen	Goshen	September 3–4	......	611	1,051	......	......	......	1,662
Guilford	Guilford	September 25	......	......	6,000	......	......	......	6,000
Horseshoe Park	Willimantic	September 10–12	......	1,000	3,500	2,500	......	......	7,000
Haddam Neck	East Hampton	September 11	......	......	1,400	......	......	......	1,400
Harwinton	Harwinton	October 8	......	15,000	......	......	......	......	15,000
Lyme Grange	Hamberg	September 18	......	......	......	......	......	......	1,900
New London County	Norwich	September 2–5	......	5,000	6,000	1,500	......	......	12,500
New London County Hort.	Norwich	June 25 and Sept. 28	......	......	......	......	......	......	725
New Haven County Hort.	New Haven	September 11–12	......	......	200	300	......	......	500
Norfolk	Norfolk	September 19–20	......	......	......	900	1,400	......	2,300
North Stonington	North Stonington	September 18–20	......	......	1,500	4,000	2,500	......	8,000
Orange	Orange	September 2	500	......	......	......	......	......	500
Rockville Fair Associotion	Rockville	Septemper 17–19	......	400	9,000	1,500	......	......	10,900
Stafford Springs	Stafford Springs	October 10–12	......	......	......	1,500	5,400	5,000	11,900
Suffield	Suffield	October 1–2	......	3,000	7,000	......	......	......	10,000
Union	Broad Brook	September 25	......	......	......	......	......	......	6,000
Union Society of Barkhamsted, Colebrook and Hartland	Riverton	October 12	......	......	......	......	......	......	2,500
Windham County	Brooklyn	September 24–26	......	......	3,500	1,000	......	......	4,500
Woodstock	South Woodstock	September 16–18	......	4,000	1,250	......	......	......	5,250
Washington	Washington	October 1	......	2,000	......	......	......	......	2,000
Wolcott	Wolcott	September 6	......	......	......	......	1,800	......	1,800

AGRICULTURAL FAIRS IN CONNECTICUT, 1912.

NAME OF SOCIETY	PLACE	DATE	PRESIDENT	SECRETARY
Berlin	Berlin	Sept. 24 to 27	C. M. Jarvis	L. W. Gwatkin
Beacon Valley	Naugatuck	Oct. 15	E. P. O'Brien	E. I. Ahern
Conn. Fair Association	Charter Oak Park	Sept. 2 to 7	J. L. Dower	G. C. Eno
Conn. Dairymen's Association	Hartford	Jan.	G. W. Davis	J. G. Schwink
Conn. Pomological Society	Berlin	Sept. 24 to 27	J. N. Barnes	H. C. C. Miles
Conn. Horticultural Society	Unity Hall, Hartford	Sept. 19 and 20	I. A. Webber	G. W. Smith
Conn. Bee Keepers' Association	Charter Oak Park	Sept. 2 to 7	Allen Latham	J. A. Smith
Chester	Chester	Sept. 17	Theodore Foster	W. P. Holden
Colchester	Colchester	Oct. 3	F. H. Browning	C. E. Staples
East Haddam	East Haddam	Sept. 11	R. S. Bailey	G. E. Wilkes
Granby	Granby	Sept. 26 and 27	G. O. Beach	Charles Allshouse
Goshen	Goshen	Sept. 3 and 4	E. O. Wright	E. H. Johnson
Guilford	Guilford	Sept. 25	William T. Foote	R. DeF. Bristol
Horseshoe Park	Willimantic	Sept. 10 to 12	A. C. Williams	S. B. Harvey
Haddam Neck	East Hampton	Sept. 11	E. W. Crocker	G. M. Smith
Harwinton	Harwinton	Oct. 8	F. A. Cleveland	W. F. Balch
Lyme Grange	Hamburg	Sept. 18	R. L. Harding	J. W. Stark
New Haven County Hort. Society	New Haven	Sept. 2, 3, 4 and 5	A. D. Lathrop	C. D. Greenman
New London County Hort. Society	Norwich	Sept. 11 and 12	James Kydd	David Wyllie
New London County	Norwich	June 25 and Sept. 28	S. A. Gilbert	F. N. Allen
Norfolk	Norfolk	Sept. 19 and 20	S. P. Humphrey	W. A. Spaulding, Jr.
North Stonington	North Stonington	Sept. 18 to 20	C. H. Brown	C. P. Kendall
Orange	Orange	Sept. 2	Walter S. Hine	I. A. Andrews
Rockville Fair Association	Rockville	Sept. 17 to 19	O. A. Leonard	H. C. Smith
Stafford Springs	Stafford Springs	Oct. 10 to 12	W. H. Hall	C. F. Beckwith
Suffield	Suffield	Oct. 1 and 2	G. S. Phelps	J. P. Graham
Union	Broad Brook	Sept. 25	E. S. Fuller	E. W. Avery
Union Society of Barkhamsted, Colebrook and Hartland	Riverton	Oct. 12	T. C. Barnes	H. P. Deming
Windham County	Brooklyn	Sept. 24 to 26	G. S. Carey	J. B. Stetson
Woodstock	South Woodstock	Sept. 16 to 18	H. O. Preston	L. H. Healey
Wolcott	Wolcott	Oct. 1	W. A. Faber	W. V. Warner
Washington	Washington	Sept. 6	D. S. Hartwell	C. E. Hough

Officers of Connecticut State Grange.

Master,	J. ARTHUR SHERWOOD, Long Hill
Overseer,	CHARLES T. DAVIS, Middletown
Lecturer,	F. E. BLAKEMAN, Oronoque
Steward,	ARD WELTON, Terryville
Assistant Steward,	WALTER S. HINE, Derby
Chaplain,	REV. J. H. HOYT, New Canaan
Treasurer,	N. S. PLATT, 395 Whalley Ave., New Haven
Secretary,	H. E. LOOMIS, Glastonbury
Gate-Keeper,	F. M. CANDEE, Naugatuck
Ceres,	MRS. ALICE L. POTTER, Southbridge, Mass.
Pomona,	MRS. ROSE E. GOODALE, Glastonbury
Flora,	MRS. URSULA E. AVERY, Norwich
Lady Steward,	MRS. ROBERT S. BAILEY, Middle Haddam

Executive Committee:

J. H. BLAKEMAN, Oronoque.
L. H. HEALEY, North Woodstock.
J. H. HALE, South Glastonbury.
J. ARTHUR SHERWOOD, Long Hill.
H. E. LOOMIS, Glastonbury.

Finance Committee:

H. C. DUNHAM, Middletown.
FREDERICK KELSEY, Higganum.
C. E. STAPLES, Colchester.

Woman's Work:

MISS E. E. SUTLIFFE, Plymouth.

Deputies:

Central Pomona, No. 1—JOHN H. FRANCIS, Wallingford; LOUIS G. TOLLES, Southington.

Quinebaug, No. 2—EVERETT E. BROWN, Pomfret.

East Central, No. 3—C. W. BRADLEY, Rockville; W. E. PRICE, Warehouse Point.

Mountain County, No. 4—C. H. TWING, East Morris.

New Haven County, No. 5—W. H. BALDWIN, Cheshire.

New London County, No. 6—IRVING E. CROUCH, Groton.

Excelsior, No. 7—W. L. PIERPONT, Waterbury.

Sea View, No. 8—ALBERT M. BUELL, Clinton.

Fairfield County, No. 9—A. W. NORTHROP, Ridgefield.

Housatonic Valley, No. *10*—WM. M. CURTISS, New Milford.

Taxation Committee:

J. NORRIS BARNES, Yalesville.
L. M. REED, Union.
G. C. BECKWITH, Nepaug.

Special Deputies:

ALLEN B. COOK, Farmington.
H. D. SIKES, Suffield.

Juvenile Deputy:

P. B. SIBLEY, Danielson.

REPORT OF THE TREASURER.

CHAS. A. THOMPSON *in account with*

STATE BOARD OF AGRICULTURE.

			DR.	CR.
1911.				
July	1.	Balance amount in treasury,	$101.22	
"	14.	B. C. Patterson, traveling expenses,		$ 24.40
"	"	D. Walter Patten, traveling expenses,		37.65
Sept.	5.	E. H. Jenkins,		5.77
"	"	L. H. Healey, hotel and R. R. expenses,		81.10
"	12.	J. M. Trueman, for institute,		6.20
"	"	R. R. Evans, Jr., printing,		42.85
"	"	Charles S. Phelps, institute,		6.68
"	"	G. Warren Davis, field meeting,		12.87
"	"	C. D. Jarvis, institute,		8.40
"	"	By State appropriation,	$1,000.00	
"	"	By Comptroller, fair appropriation,	5.69	
Nov.	2.	J. B. Palmer, expenses,		26.15
"	"	George A. Barnes, expenses,		9.80
"	"	R. R. Evans, Jr., printing,		24.25
"	"	Richard E. Dodge, expenses,		15.33
Dec.	13.	Joseph Wing, lectures and expenses,		118.50
"	14.	L. H. Healey, expenses and express,		106.23
"	"	Miss Mary Yates, lecture,		53.80
"	"	The Stratfield,		234.55
"	15.	Leroy S. Newton,		2.00
1912.				
Jan.	9.	L. H. Healey, one-half salary,		500.00
"	"	L. A. Clinton, institute,		8.60
"	"	R. R. Evans, Jr., printing,		24.00
"	"	W. H. Davenport, lecture,		17.98
"	"	C. D. Jarvis, expenses,		8.35
"	"	D. W. Patten, expenses,		16.10
"	"	A. G. Gulley, expenses,		4.08
"	"	Connecticut Farmer Co., advertising,		20.00
"	"	A. T. Stevens, institute,		10.00
"	"	J. B. Palmer, expenses,		13.26
"	"	David Snedden, lecture,		11.27
"	"	L. S. Newton, prize on corn,		16.67
"	"	L. H. Healey, Jr., prize on corn		16.07

1912.			Dr.	Cr.
Jan.	9.	Andrew Schwab, prize on corn,		15.17
"	"	John W. Rice, prize on corn,		14.27
"	"	John Tooth, prize on corn,		15.07
"	"	George Mellor, prize on corn,		15.27
"	"	The Stratfield, winter meeting,		25.50
"	"	L. H. Healey, irrigation exposition,		39.26
"	"	C. A. Thompson, one-half salary and exp.,		49.14
"	10.	By State Appropriation,	$1,000.00	
"	"	Wilson H. Lee,		2.90
"	"	W. C. Sanford, expenses,		7.00
"	"	Annet Barrows, lecture,		22.50
"	"	G. A. Drew,		19.30
"	"	By Fair Appropriation,	171.80	
"	"	Chas. F. Roberts,		5.40
"	"	Macey, Stetson Morris Co., cards,		8.10
"	"	Walter Yale, prize on corn,		5.00
"	"	Alfred Rooke, prize on corn,		5.00
"	"	Fred F. Meeker, prize on corn,		3.00
"	"	A. S. Wakeman, prize on corn,		2.00
"	"	Poplar Hill Farm, prize on corn,		5.00
"	"	B. W. Bishop, price on corn,		5.00
"	"	Ewart and Merrill Healey, prize on corn,		5.00
"	"	Geo. W. Clark and Son., prize on corn,		18.00
"	"	C. H. Killam, prize on corn,		4.00
"	"	Chas. Schwab, prize on corn,		7.50
"	"	Henry C. Schwab, prize on corn,		5.00
"	"	F. E. Blakeman, prize on corn,		8.00
"	"	Walter Yale, prize on corn,		5.00
"	"	H. O. Preston, prize on corn,		3.00
"	"	Alfred Rooke, prize on corn,		2.50
"	"	Ethel Barrett, prize on corn,		8.00
"	12	Ridgefield Printing Co., advertising,		5.40
"	"	The Advertiser, advertising,		6.00
"	"	Canaan Printing Co., advertising,		2.40
"	"	Milford Citizen, advertising,		2.40
"	"	Bill Bros., storage,		12.27
"	"	Danbury News, advertising,		9.60
"	"	New Canaan Messenger, advertising,		8.00
"	"	The Darien Review, advertising,		2.50
"	"	John Hamilton, dues,		5.00
"	"	New Milford Gazette, advertising,		7.50
"	"	Newtown Bee, advertising,		5.00
"	"	The Standard Association, advertising,		12.00
Feb.	7.	H. C. C. Miles, institutes,		350.00
"	"	By State Appropriation,	500.00	
"	"	L. H. Healey, expenses,		29.35

	1912.		Dr.	Cr.
Feb.	7.	E. E. Brown, expenses,		20.45
"	"	H. O. Daniels, lecture,		11.90
"	"	E. H. Jenkins, expenses,		1.45
"	"	Chas. L. Gaylord, decorating		15.00
"	"	Chas. T. Roberts,		110.00
"	"	Case, Lockwood & Brainard Co.,		99.09
May	18.	Fay O. Brien,		10.00
"	"	R. R. Evans, Jr., printing,		30.00
"	29.	E. P. Chesbro, auto hire,		12.50
June	21.	By State Appropriation.	1,000.00	
"	"	J. A. Sherwood, expenses,		15.80
"	"	D. W. Patten, expenses,		18.35
"	"	L. H. Healey, one-half salary and expenses,		594.36
"	"	J. B. Palmer, expenses,		32.85
"	"	William L. Davis, expenses,		15.50
"	"	E. E. Brown, expenses,		10.35
"	"	George A. Cosgrove, expenses,		16.66
June	27.	C. A. Thompson, one-half salary and exp.		36.20
"	"	Wilson H. Lee, expenses,		4.15
"	"	Balance amount in taeasury,		478.89
			$3,778.71	$3,778.71

We have this day examined the accounts of Charles A. Thompson, treasurer, and find the same correct to date.

J. B. Palmer, } Auditors.
D. Walter Patten, }

Hartford, Conn., June 27, 1912.

Connecticut Dairymen's Association

List of Officers for the Year Ending February 15, 1913.

President,	F. E. DUFFY, West Hartford
Vice-President,	H. W. ANDREWS, Brookfield Center
Treasurer,	R. E. BUELL, Wallingford
Secretary,	J. G. SCHWINK, Meriden

Directors:

R. J. AVERILL,	Washington Depot
H. L. GARRIGUS,	Storrs
E. A. JONES,	New Canaan
H. O. DANIELS,	Middletown
C. B. POMEROY,	Willimantic
ADOLPH GREENBACKER,	Meriden
THOMAS HOLT,	Southington
E. J. HEMPSTEAD, Jr.	New London
WILSON H. LEE,	New Haven

CONNECTICUT DAIRYMEN'S ASSOCIATION.

Financial Statement.

A financial statement of the Connecticut Dairymen's Association for the year ending December 1, 1912, made to L. H. Healey, Secretary of the State Board of Agriculture.

RECEIPTS.

Memberships	$ 261.00
Comptrollers' orders	1,801.21
Premium fund	198.40
Rent of space	75.00
Miscellaneous	111.47
Donated for premiums	320.00
Cash on hand December 1, 1911	569.58
	$2,836.66

EXPENDITURES.

Directors' expenses	189.89
Printing	372.56
Secretary's salary	200.00
Institute expenses	104.38
Annual meeting	592.56
Premiums	698.00
Miscellaneous	36.50
Cash on hand December 1, 1912	642.77
	$2,836.66

Attest:

J. G. SCHWINK, Jr., Secretary.

The Connecticut Pomological Society

List of Officers for the Year Ending February 1, 1914.

President,	J. NORRIS BARNES, Yalesville
Vice-President,	STANCLIFFE HALE, South Glastonbury
Secretary,	H. C. C. MILES, Milford
Treasurer,	ALLEN B. COOK, Farmington

County Vice-Presidents:

Hartford,	L. C. ROOT, Farmington
New Haven,	A. T. HENRY, Wallingford
Fairfield,	G. A. DREW, Greenwich
Litchfield,	E. D. CURTIS, Bantam
New London,	F. W. BROWNING, Norwich
Middlesex,	HENRY H. LYMAN, Middlefield
Windham,	E. E. BROWN, Pomfret Center
Tolland,	C. H. SAVAGE, Storrs

CONNECTICUT POMOLOGICAL SOCIETY.

Financial Statement.

A financial statement of the Connecticut Pomological Society for the year, from February 1, 1912 to February 1, 1913, made to L. H. Healey, Secretary of the State Board of Agriculture.

RECEIPTS.

Balance on hand Feb. 1, 1912	$ 254.25
Received from annual membership fees,	736.00
Received from rent of hall space for exhibits	80.50
Received from sales exhibition fruit	4.50
Received from State appropriation	1,765.57
Received from State Agricultural Society (Berlin Fair)	100.00
	$2,940.82

EXPENDITURES.

Expenses annual meeting	$712.05
Publishing annual report	752.49
Expenses annual Fall exhibition	133.80
Premiums paid	409.25
Field meetings	24.30
Institute work	169.75
Secretary's office	297.65
Literature furnished to members	208.38
President's office (1911)	49.26
Treasurer's office (1911)	12.34
Miscellaneous printing and advertising	84.28
Sundry expenses	60.45
	$2,914.00
Balance on hand February 1, 1913,	26.82
	$2,940.82

Attest:

H. C. C. MILES, Secretary.

Connecticut Poultry Association

List of Officers for the Year Ending December 31, 1913.

President,	H. P. DEMING, Robertsville
Secretary,	GEORGE V. SMITH, West Willington
Treasurer,	CHARLES H. DRUNDAGE, Danbury
Attorney,	CHARLES F. ROBERTS, New Haven

County Vice-Presidents:

Litchfield,	H. J. NEWBURY, Torrington
Fairfield,	W. O. BURR, Fairfield
New Haven,	CHARLES S. SCOVILLE, East Haven
Hartford,	S. G. McLEAN, South Glastonbury
Middlesex,	A. S. BAILEY, Cobalt
Tolland,	E. S. EDGERTON, West Willington
New London,	W. W. COUCKLIN, New London
Windham,	GERALD WALDO, Willimantic

Executive Committee:

P. B. WHITEHEAD,	Romford, Litchfield County
A. B. BRUNDAGE,	Danbury, Fairfield County
WILLIAM J. MAHER,	New Haven, New Haven County
C. M. MURPHY,	South Manchester, Hartford County
E. W. CROCKER,	East Hampton, Middlesex County
W. P. JOHNSON,	Columbia, Tolland County
E. W. BROWN,	Old Mystic, New London County
W. G. HOLMAN,	Phœnizville, Windham County

Members-at-Large:

W. O. ROGERS,	Norwich
PAUL P. IVES,	Guilford
WARREN HAYDEN,	East Hartford

Auditors:

C. I. BALCH,	Manchester
H. L. HAMILTON,	Ellington

CONNECTICUT POULTRY ASSOCIATION.

Financial Statement.

A financial statement of the Connecticut Poultry Association for the year ending February 18, 1913, made to L. H. Healey, Secretary of the State Board of Agriculture.

RECEIPTS.

Cash on hand January 26, 1912	$ 890.20
Cash from Secretary for memberships	522.50
State appropriation	1,000.00
	$2,412.70

EXPENDITURES.

Treasurer's bond	$ 5.00
Attorney's services and expenses	35.00
Premiums charged to membership account	182.50
Secretary's salary	120.00
Postage	78.68
Directors' expenses	162.45
Advisory Board on Farmers' Institutes	150.00
Field Meeting at Storrs	118.60
Annual meeting	162.30
Printing	186.75
Institutes	586.55
Cash on hand February 18	624.87
	$2,412.70

Attest:

GEORGE V. SMITH, Secretary.

Connecticut Sheep Breeders' Association

List of Officers for the Year Ending December, 1913.

President,	ALLEN B. COOK, Farmington
Vice-President,	C. L. GOLD, West Cornwall
Secretary and Treasurer,	B. C. PATTERSON, Torrington

Directors:

Hartford County,	F. H. STADTMUELLER, Elmwood
New Haven County,	D. M. MITCHELL, South Britain
New London County,	J. B. PALMER, Norwich, R. D. 4
Fairfield County,	F. CHAMBERS, Waterbury
Tolland County,	P. G. TRIPP, Rockville
Middlesex County,	CHARLES E. LYMAN, Middlefield
Litchfield County,	W. L. PENDECORT, Chapinville
Windham County,	C. S. HYDE, Brooklyn

CONNECTICUT SHEEP BREEDERS' ASSOCIATION.

Financial Statement.

A financial statement of the Connecticut Sheep Breeders' Association for the year ending December 1, 1913, made to L. H. Healey, Secretary of the State Board of Agriculture.

RECEIPTS.

Cash on hand December 1, 1911	$ 98.74
Membership	11.00
Comptroller's orders	626.80
	$736.54

EXPENDITURES.

Bounty	$ 75.00
Premiums	57.00
Printing	36.50
Institute work	75.00
Annual meeting	80.85
Officers' and Directors' expenses	121.11
Miscellaneous expenses	186.34
Cash on hand December 1, 1912	104.74
	$736.54

Attest:

BURTON C. PATTERSON, Secretary.

Connecticut Bee Keepers' Association

List of Officers for the Year Ending December 31, 1912.

President, - - -	ALLEN LATHAM, Norwich Town
Vice-President, - -	REV. D. D. MARSH, West Hartford
Secretary and Treasurer, - -	JAMES A. SMITH, Hartford

Executive Committee:

H. W. COLEY, Westport.
STEPHEN J. GRIFFEN, Bridgeport.
LYMAN C. ROOT, Stamford.

State Fair Committee:

A. W. YATES, Hartford.
REV. D. D. MARSH, West Hartford.
RICHARD H. NOBLE, East Hartford.
F. E. CLARK, Poquonork.

CONNECTICUT
BEE KEEPERS' ASSOCIATION.

Financial Statement.

A financial statement of the Connecticut Bee Keepers' Association for the year ending December 31, 1912, made to L. H. Healey, Secretary of the State Board of Agriculture.

RECEIPTS.

Balance on hand January 1, 1912	$ 10.54
Connecticut Fair Association	200.00
Bills payable	200.00
State Appropriation	198.40
Annual memberships	89.50
Subscriptions	83.66
Entry fees	24.50
	806.60

EXPENDITURES.

Premiums	504.50
Bills payable	200.00
Expenses	58.83
Connecticut Farmer, subscriptions	26.00
Cash on hand December 31, 1912	17.27
	806.60

Attest:

JAMES A. SMITH, Secretary.

OFFICERS OF THE GRANGES.

Name		Master	Lecturer	Secretary.
Pomona Granges.				
Central Pomona,	No. 1	Allen B. Cook, Farmington	Mrs. Clara W. Crowell, Middletown	Miss Florence A. Cowles, Plainville
Quinebaug Pomona,	2	George C. Phillips, West Woodsto'k	A. J. Kennedy, Putnam	F. C. Lummis, Chaplin
East Central Pomona,	3	Walter E. Price, Warehouse Point	Chas. R. Risley, Silver Lane	Laura J. Brewer, Glastonbury
Mountain Co. Pomona,	4	Arthur B. Ferry, Winsted	Edith E. Sutliffe, Plymouth	Fred L. Tharp, Litchfield
New Haven Co. Pomona,	5	Hobart J. Brockett, North Haven	Rev. Frederick E. Snow, Guilford	Flora E. Hough, Wallingford
New London Co. Pomona,	6	B. T. Avery, Norwich	Mrs. Maude Bliss, Norwich	Alice A. Bishop, Norwich Town
Excelsior Pomona,	7	Arthur F. Copeland, Thomaston	Mrs. Mabel F. Griswold, Hartford	Mrs. Martha E. Judd, Middlebury
Sea View Pomona,	8	Edwin H. Wright, Clinton	Mrs. Gertrude Smith, East Lyme	D. Eugene Smith, Madison
Fairfield County Pomona,	9	Mrs. Wallace N. Mitchell, Newtown	Clarence Shipman, Westport	Mrs. N. E. Blakeman, Oronoque
Housatonic Valley Pomona,	10	James S. Chaffee, Amenia, N. Y.	Mrs. E. E. Abbott, New Milford	Clifford E. Spooner, South Kent
Subordinate Granges.				
Washington,	11	Richard E. Dodge, Washington	Herbert G. Hallock, Wash'n Depot	S. Wilford Seeley, Washington Depot
Tunxis,	13	Charles Roemer, Hartford	Not elected	Frank M. Murdock, Bloomfield
Hope,	20	Howard J. Newbury, Torrington	Mrs. H. J. Newbury, Torrington	W. L. Burton, Torrington
Lebanon,	21	Otto L. Pultz, Lebanon		Mrs. Mercy E. Fuller, Lebanon
Cheshire,	23	Mark Bishop, Cheshire	Mrs. Alice C. Terrell, Cheshire	Graham A. Hitchcock, Cheshire
Berlin,	24	George J. Read, Berlin	Mrs. A. Watkins, Kensington	Louis R. Goodrich, Kensington
Union,	25	L. G. Tolles, Southington	D. H. Bennett, Plantsville	A. S. Chaffee, Milldale
Glastonbury,	26	Willis Hodge, South Glastonbury	Mrs. Helen Lates, Glastonbury	Miss Tillie Hamilton, So. Glastonbury
Suffield,	27	Kirk Jones, Suffield	George L. Cheelman, Suffield	Leroy H. Sikes, Suffield
Meriden,	29	William H. Pomeroy, Meriden	Mrs. Lura J. Pomeroy, Meriden	Mrs. Mabel Francis, Wallingford
Wapping,	30	Lucius V. Platt, Wapping	Donald C. Johnson, Wapping	Mrs. Hattie E. Johnson, Wapping
Manchester,	31	F. R. Manning, South Manchester	Mrs. Amy Brown, So. Manchester	Keeney B. Loomis, So. Manchester
North Cornwall,	32	F. A. Whitcomb, West Cornwall	A. C. Borland, West Cornwall	Mrs. Wm. R. Brush, West Cornwall
Wallingford,	33	W. A. Simpson, Wallingford	Norman Barnes, Wallingford	Louie Hall, Wallingford
Cawasa,	34	Burton N. Bristol, Canton Center	Mrs. M. E. Mitchell, Collinsville	John Crowley, (elected, died Jan. 11)
North Haven,	35	Arthur B. Thorpe, North Haven	Myron Brockett, North Haven	Mrs. A. H. Carlson, North Haven
Little River,	36	Charles E. Burnham, Hampton	Arthur B. Roberts, Hampton	Delia C. Litchfield, Hampton
East Hartford,	37	Fred M. Smith, Silver Lane	Mrs. Amy Spencer, Hartford	Robert A. Hall, East Hartford
New Canaan,	38	Myron E. Crawford, New Canaan	Darius A. St. John, New Canaan	Frank N. Horton, New Canaan
Burritt,	39	H. S. Blake, New Britian	Mrs. W. H. Horsfall, New Britain	Mrs. F. H. Sharpe, New Britian
Senexet,	40	Chauncey S. Child, Woodstock	Herbert Nelson, Woodstock	John E. Clark, Woodstock
Konomoc,	41	Ernest E. Lewis, Waterford	Mrs. Ada Wright, Waterford	Miss Mary A. Chappell, Waterford
Mattabessett,	42	Willis E. Bacon, Middletown	Mrs. Chas. T. Davis, Middletown	Elden Crowell, Middletown
Brooklyn,	43	Charles A. Downs	Susie G. Williams, Brooklyn	Daniel M. Havens, Brooklyn
Newington,	44	Clinton S. Burrows, New Britain	George W. Haubury, Newington	T. A. Francis, Newington
Harwinton,	45	Fred Slate, Thomaston	Mrs. Mabel Fens, Torrington	Miss Eveline S. Barker, Torrington
Ellington,	46	Arthur D. Hale, Ellington	Florence Rowe, Ellington	Charles R. Thrall, Ellington
Bolton,	47	Fred D. Finley, Andover	Miss A. N. Loomis, Bolton	Elizabeth H. White, Bolton

OFFICERS OF THE GRANGES.—*Continued*

NAME		MASTER	LECTURER	SECRETARY
SUBORDINATE GRANGES.—Cont.				
Whigville,	No. 48	A. H. Bradley, Bristol	Mrs. E. W. Hart, Forestville	Mrs. C. A. Wilcox, Bristol
Farmington,	49	Robert E. Ayer, Unionville	Grace E. Mckenney, Farmington	Warren S. Mason, Farmington
Westfield,	50	F. E. Boardman, Middletown	Mrs. Robbins Gilbert, Middletown	Mrs. M. A. Nott, Middletown
Tolland,	51	D. A. Brown, Tolland	Mrs. L. S. Hall, Tolland	H. R. Bartlett, Tolland
Vernon,	52	Luther C. Skinner, Rockville	Mrs. Margaret Webster, Rockville	Elmer L. Reed, Rockville
Plainville.	54	Theodore A. Lyman, Plainville	Miss May B. Hart, Plainville	Miss Flowence A. Cowles, Plainville
Stafford,	55	Rev. Dr. Isaac P. Booth, Stafford	Miss Isadore Dunham, Stafford	Miss Mabelle E. Edson, Stafford
East Haddam,	56	Edward Smith, East Haddam	Mrs. Countryman, East Haddam	S. E. Williams, Colchester
Durham,	57	F. E. Korn, Durham	Miss Myra Davis, Durham Center	Mrs. G. T. Nettleton, Durham Center
West Hartford,	58	Fred R. Seymour, West Hartford	Frank J. Sparks, West Hartford	Arthur R. Thompson, West Hartford
Saybrook,	59	John S. Dickinson, Saybrook	Miss Olive N. Clark, Saybrook	Mrs. Ida H. McAllister, Saybrook
Wolf Den,	61	Herbert R. Slye, Pomfret Center	Mrs. W. Brown, Pomfret Center	Miss Euretta G. Grosvenor, Abington
Eureka,	62	G. C. Beckwith, New Hartford	Mrs. Ernest Atwood, N. Hartford	H. H. Spencer, New Hartford
Middlefield,	63	Walter S. Nettleton, Middlefield	Miss Alma Lyman, Middlefield	Miss Bertha Camp, Middlefield
Mansfield,	64	John N. Fitts, Storrs	Miss Maud E. Hayes, Storrs	Edward B. Fitts, Storrs
Quinnatissett,	65	Miss Sybil Pettis, Thompson	Mrs. Lilla Babbitt, Thompson	Mrs. William Bates, Thompson
Killingworth,	66	Charles H. Coe, Clinton	Bertha A. Griswold, Higganum	Lovel D. Parmelee, Clinton
Cromwell,	67	Walter F. Fanthrop, Cromwell	Mrs. Ida M. Barrows, Cromwell	Miss Lottie M. Sage, Cromwell
Natchaug,	68	Orrin F. Wilson	Mrs. G. B. Howard	F. C. Lummis, Chaplin
Shetucket,	69	Leon J. Moffitt, Scotland	Ruth Ashcraft, Scotland	Alice Sweet, Willimantic
Canterbury,	70	Howard F. Hoxsie, Canterbury	Mrs. Lillian Frink, So. Canterbury	Levi N. Clark, South Canterbury
Mad River,	71	George F. Byam, Waterbury	Florence Woodworth, Waterbury	Miss Bessie D. Parks, Waterbury
Plymouth,	72	Harry B. Taylor, Plymouth	Mrs. Maud Alford, Plymouth	Allan D. Canfield, Thomaston
Indian River,	73	David A. Clarke, Milford	Mrs. Mary Gregory, Milford	Dr. A. L. Tuttle, Milford
Winchester,	74	T. H. Apley, Winchester Center	Mrs. Fannie Bronson, Winch't'r Cr.	Mrs. B. A. Brooks, Winchester Cen.
Coventry,	75	Isaac P. Fiske, M. D., Rockville	Miss Maud Murphy, Rockville	Mrs. Edith P. Haven, So. Coventry
Andover,	76	C. Parker Stearns, Andover	Mrs. Clara Hoffner, Andover	F. J. Jennett, Andover
Clinton,	77	Albert M. Buell, Clinton	D. Eugene Smith, Madison	Wm. H. Kelsey, 2d, Clinton
Colchester,	78	F. H. Browning, Colchester	Mrs. F. H. Browning, Colchester	C. E. Staples, Colchester
Housatonic,	79	J. W. Holmes, Stratford	Miss Alice Wakeley, Stratford	Alice M. Wilcoxson, Stratford
Guilford,	81	Calvin M. Leete, Leete Island	Mrs. Ruth Lee Baldwin, Guilford	W. C. White, Guilford
Colebrook,	82	Henry Vining, Winsted	Anna E. Suydam, Winsted	Mrs. S. E. Northrop, Colebrook
Totoket,	83	Elon H. Rose, Branford	Mrs. William Palmer, Branford	Miss Lucretia H. Burr, Branford
Foxon,	84	Arthur Sperry, Branford	Mrs. May Merrick, Branford	Sarah E. Bailey, East Haven
Wangumbaug,	85	F. A. Spaulding, South Coventry	Miss Mary Green, South Coventry	Miss Helen Potter, Willimantic
Webutuck,	86	J. H. Howland, Amenia Union, N. Y.	Mrs. Alonson Odell, Sharon	Mrs. F. R. Rundall Amenia U'n, N. Y.
Hillstown,	87	John F. Mulcahy, Glastonbury	Mrs. W. C. Mulcahy, Glastonbury	Miss Emma V. Bancroft, Glastonb'y
Ekonk,	89	Harry Sayles, Moosup	Miss Jeanette Gallup, Moosup	Mrs. Lottie S. Gallup, Moosup
Ashford,	90	Robert M. Balch, Warrenville	Frank H. Bennett, Ashford	Mrs. Addie Bassett, Warrenville
Seymour,	91	Otis C. Francis, Seymour	Mary A. Hull, Seymour	Emma E. Francis, Seymour

OFFICERS OF THE GRANGES.—*Continued.*

NAME		MASTER	LECTURER	SECRETARY
SUBORDINATE GRANGES.—Cont.				
Harmony,	No. 92	Clarence B. Burr, Stepney Depot,	Mrs. Minnie F. Lacey, Bridgeport	Edward C. Shelton, Stepney Depot
East Windsor,	94	Frank Stiles, Broad Brook	Lemuel Stoughton, Warehouse P't.	J. S. Allen, East Windsor
Pachaug,	96	Willis C. Terry, Norwich	Walter C. Tanner, Voluntown	Wm. A. Edmond, Jewett City
Putnam,	97	Howard C. Bradford, Putnam	Miss Beatrice Kennedy, Putnam	Mrs. Ella R. Wood, Putnam
Taghhannuck,	100	Edward H. Prindle, Sharon	Alida C. Buckley, Amenia, N. Y.	Adella M. Tharp, Sharon
Mashpaug Lake	101	L. M. Reed, Stafford Springs	Mrs. Ella Barrows, Stafford Sp'gs	Everett Barlow, North Ashford
Beacon Valley,	103	Mrs. Jessie Perry, Union City	Mrs. Mary A. Noble, Naugatuck	F. M. Candee, Naugatuck
Somers,	105	Horaco Sikes, Somers	Mrs. M. P. Avery, Somers	William Healey, Somers
Litchfield,	107	Willey D. Buell, Litchfield	Mrs. Charlotte Stoddard, Litchfi'ld	Travis A. Ganung, Litchfield
Woodbridge,	108	Thomas Bartlett, Westville	E. A. Hitchcock, Westville	Leroy C. Beecher, Westville
East Hampton,	109	Cornelius W. Day, East Hampton	Royal Goff, East Hampton	Ola M. West, East Hampton
Preston City,	110	Allen B. Burdick, Norwich	Chas. Zabriskie, Norwich	Mrs. Louisa Lundgren, Norwich
Hebron,	111	Rev. J. G. W. Harold, Gilead	Mrs. Florence Hodge, Gilead	Mrs. Mary C. Gilbert, Gilead
Killingly,	112	F. J. G. Bailey, Danielson	Miss Ella Day, Danielson	Miss Myrtice Pellett, Danielson
Highland,	113	Rev. H. B. Goodsell, Danielson	Mrs. G. Edgerly, Danielson	S. A. Dougluss, Danielson
Wethersfield,	114	Walter M. Coe, Wethersfield	Mrs. Roe, Wethersfield	Jennie L. Stevenson, Wethersfield
Rocky Hill,	115	Charles E. Holmes, Rocky Hill	Miss Lillian M. Austin, Rocky Hill	M. R. Schoenbarn, Rocky Hill
Bristol,	116	A. D. Perkins, Forestville	Miss Lena Carter, Bristol	Lawrence Buskey, Forestville
Unity,	117	Edward Burk, Deep River	Roland Post, Deep River	Mrs. Mable Laplace, Deep River
Beacon,	118	Robert A. Goodwin, Litchfield	Elwin J. Morse, Norfield	Chas. S. Nearing, Northfield
Morris,	119	Jesse E. Humphrey, Morris	Florence Jones, Lakeside	Albert Humphrey, Morris
Bethlehem,	121	Rev. C. H. Beers, Washington	Miss Edith Lake Bethlehem	Miss Ina Lake, Watertown
Watertown,	122	A. F. Copeland, Thomaston	Bert Johnson, Watertown	Charles Dayton, Watertown
Westbrook,	123	Horace E. Kelsey, Westbrook	Miss Edna Slannard, Westbrook	David C. Dibble, Westbrook
Higganum,	124	August B. Carlson, Higganum	Mrs. Anna Neff, Higganum	Eugene O. Burr, Higganum
Hollenbeck,	125	Walter J. Kellogg, Falls Village	Mrs. Levi Ganser, Falls Village	Robt. E. Pendleton, Falls Village
Pleasant Valley,	126	A. R. Gibson, Sr., Woodbury	Mrs. Katie M. Gibson, Woodbury	Arthur N. Skillon, Woodbury
Goodwill,	127	Frank Ames Glastonbury	Mrs. Rose Goodale, Glastonbury	H. B. Waldo, Glastonbury
Orange,	128	Irving A. Andrews, Orange	Mrs. Florence Andrew, Orange	Miss Bessie Otis, Orange
Pohtatuck,	129	A. P. Smith, Newtown	Mrs. Emma Mitchell, Newtown	Miss Hattie Northrop, Newtown
Farmill River,	130	Fred Coroltra, Shelton	Miss Ethel Beadsley, Bridgeport	Orvill Morse, Shelton
Columbia,	131	Rowland L. Cobb, Columbia	Miss Harriet A. Brown, Columbia	Miss A. J. Fuller, Columbia
Wichita,	132	F. P. Johnson, Cornwall Bridge	Mrs. Amy Palmer, Cornwall Bridge	Harold Fellers, Cornwall Bridge
Greenfield Hill,	133	Clifford J. Brotherton, Southport	John C. Lobdell, Fairfield	D. F. Brown, Fairfield
Trumbull,	134	Emil T. Berger, Bridgeport	Leland Williams, Bridgeport	Mrs. Ella E. Rogers, Bridgeport
Silver Lake,	135	Geo. B. Hamlin, Sharon	Mrs. Edward P. Hazard, Sharon	Evelyn Scott, Sharon Valley
East Canaan,	136	Rev. C. W. Hanna, East Canaan	Javris C. Stevens, Canaan	Clara M. Bottum, East Canaan
Willington,	137	Geo. V. Smith, West Willington	Mrs. Alice T. Smith, W. Willington	Mrs. Estelle Pratt, W. Willington
North Stonington,	138	John D. Avery, North Stonington	F. M Hollister, North Stonington	E. Frank White, North Stonington

OFFICERS OF THE GRANGES.—*Concluded.*

NAME.		MASTER	LECTURER	SECRETARY
SUBORDINATE GRANGES.—Cont.				
Middlebury,	No. 139	John T. Carragan, Middlebury	A. L. Beeman, Waterbury	A. L. Buell, Middlebury
Plainfield,	140	Nathan Exley, Plainfield	Mrs. Carrie Gardiner, Moosup	Evelyn Hall, Plainfield
Rock Rimmon,	142	John L. Rice, Beacon Falls	Mrs. M. Donovan, Beacon Falls	Frank T. Clark, Beacon Falls
Goshen,	143	Irving Lamson, West Goshen	Mrs. May Allyn, Goshen	Charles Peck, Goshen
Prospect,	144	William E. Clark, Waterbury	Mrs. William E. Clark, Waterbury	Florence Bottomley, Naugatuck
Rippowam,	145	James H. Bedell, Stamford	Mrs. Sarah E. Sarles, Springdale	Walter P. Terry, Stamford
Norfield,	146	Willis B. Banks, Westport	Elizabeth A. Pennell, Georgetown	Irving J. Lockwood, Georgetown
Lyme,	147	S. Warren Stark, Lyme	Lodowick Bill, Lyme	Ellen H. Palmer, Lyme
Easton,	149	Currel Ruman, Westport	Mrs. Hattie Candee, Bridgeport	Mrs. Lora H. Andrews, Long Hill
Woodstock,	150	Ernest B. Hibbard, Putnam	Annie L. Clarke, Putnam	Maude S. Peckham, Putnam
Enfield,	151	F. J. Pease, Hazardville	Miss Effie Davis, Hazardville	Mrs. Ellen Killam, Enfield
Cannon,	152	Eugene L. Richards, Cannon Sta.	Mrs. Lewis R. Ambler, CannonSta.	Nelson S. Hurlbutt, Cannon Station
Bridgewater,	153	Reuben W. Hawley, Bridgewater	W. M. Curtiss, Bridgewater	Bruce B. Randall, Bridgewater
Kent,	154	Gilbert A. Vincent, Kent	Mrs. Kate B. Chase, Kent	Clifford C. Spooner, South Kent
Danbury,	156	Chas. H. Brundage, Danbury	Mrs. James K. Penny, Danbury	Mrs. Edward H. Ryder, Danbury
East Lyme,	157	LeRoy Smith, East Lyme	Elizabeth Beebe, East Lyme	Gertrude Smith, East Lyme
Chester,	158	Edward B. Lynde, Deep River	Amy Smith, Chester	Wm. P. Holden, Chester
Salisbury,	159	Baldwin B. Reed, Salisbury	Mrs. Della P. Travis, Salisbury	Wm. E. Pettee, Salisbury
Aspetuck Valley,	160	Walter B. Leavenworth, N. Milford	Anna M. Hendrix, Northville	William R. Benedict, Northville
Bozrah,	161	Alice A. Bishop, Norwich	Mrs. Myron Smith, Yantic	Frank N. Gardner, Yantic
Old Lyme,	162	W. F. Clark, Lyme	Mrs. Maude Ashley, Lyme	Mazie Scallon, Lyme
Redding,	163	Albert A. Gorham, Redding	Lucy E. Sanford, Redding Ridge	Mrs. E. P. Sanford, Redding Ridge
Bethel,	164	Willis B. Judd, Bethel	Mrs. James E. Gallagher, Bethel	Mrs. H. Cornelius Judd, Bethel
Ridgefield,	165	Charles W. Bowles, Ridgefield	Arthur W. Northrop, Ridgefield	Arthur H. Thomas, Ridgefield
Salem,	166	Herbert S. Houston, Colchester	Mrs. Rose Ray, Colchester,	Mrs. William Darling, Colchester
Ledyard,	167	Mrs. William I. Allyn, Mystic	Billings T. Avery, Norwich	Mrs. Frederic Burton, Mystic
Stonington,	168	Arthur G. Wheeler, Stonington	Mrs. Eliza Barnes, Mystic	Mrs. Eliza P. Noyes, Stonington
Wemanesa,	170	George Newton, Gaylordsville	C. H. Soule, Gaylordsville	Mr. Harring, Kent
Mystic,	171	Harry O. Chapman, New London	George Griswold, Mystic	Mrs. Ruth King, Mystic
Norwich,	172	Gideon Dickenson, Norwich	Miss Ella C. Lester, Norwich,	Charles B, James, Norwich
Wolcott,	173	Adelbert E. Hitchcock, Waterbury	Edith L. Cole, Bristol,	Mabel Upson, Waterbury
Torringford,	174	Clifford W. Hopkihs, Torrington	Mrs. Eleanor J. Stalker, Winsted	Mrs. Louise Davis, Torrington
Lake Valley,	175	Charles C. Stevens, Gaylordsville	Claud Wooden, New Milford	Mrs. Rose Byer, Gaylordsville
Groton,	176	Irvin Crouch, Groton	Mrs. Irvin Crouch, Groton	Markley Allyn, Groton
Haddam Neck,	177	George E. Wilkes, East Hampton	Mrs. Hattie W. Clark, E. Hampton	Robert S. Bailey, Middle Haddam
Montville,	178	Mrs. Edith Raymond, Uncasville	Mrs. Mabel Chapman, Montville	W. W. Woodward, Norwich
Avon,	179	L. T. Cowles, Avon	Mrs. C. B. Hadsell, Avon	C. B. Hadsell, Avon
Echo,	180	L. J. Storrs, Mansfield Center	Mrs. George H. Allen, Mansfield	Miss Abbie O. Storrs, Mansfield Cr
Meadow Brook,	181	Frank O. Hall, No. Windham	Mrs. Carrie Hayden, No. Windham	F. Bernece Tucker, No. Windham
Portland,	182	Fred C. Cornwall, Portland	Mrs. Chas. G. Strickland, Portland	William B. Synnott, Portland

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State of Connecticut

PUBLIC DOCUMENT NO. 32

NINETEENTH REPORT

OF THE

Dairy and Food Commissioner

TO

THE GOVERNOR

FOR THE

Two Years Ended September 30, 1912.

PRINTED IN COMPLIANCE WITH STATUTE

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Rockville, Conn.

Letter of Transmittal

Rooms 17 and 19, State Capitol,
Hartford, Conn.
September 30, 1912.

To His Excellency, Simeon E. Baldwin, Governor of the State of Connecticut:

Sir: In accordance with the provisions of the General Statutes, as amended by Chapter 167 of the Public Acts of 1909, I herewith have the honor to submit the nineteenth Report of the State Dairy and Food Commissioner's Department for the fiscal term of two years ending September 30, 1912.

Respectfully,
HUBERT F. POTTER,
Commissioner.

Connecticut State Dairy and Food Commission

Hubert F. Potter, Commissioner, Rooms 17-19 State Capitol, Hartford, Conn.

Tyler Cruttenden, Deputy Commissioner.

Miss Irma R. Meigs, Clerk and Stenographer.

Inspectors—George T. Fowler, William J. Warner, John J. Merwin, Walter F. Potter.

BIENNIAL REPORT
of
Hubert F. Potter, State Dairy and Food Commissioner.

Rooms 17-19, State Capitol,
Hartford, Conn.

To His Excellency, Simeon E. Baldwin, Governor of Connecticut:

Sir: I have the honor to herewith transmit this my third biennial report of the Connecticut State Dairy and Food Commission for the fiscal term of two years ending September 30th, 1912.

Since my last report was printed the General Assembly has enacted a new Milk Law which is a great improvement on the old law; has passed a Turpentine Law, and a law requiring all Food Sold in Package Form to have the Net Weight, Measure, or Numerical Count, plainly and conspicuously marked on the outside of the package. This Net Weight and Measure Law will be in full force after January 11th, 1913. The law has already made the Department a large expense in procuring information about the unavoidable variations in the net quantity of food products sold in package form.

The following is a record of the examination of a large variety of foods put up in package form The samples were purchased from two or three leading wholesale grocers and each case was opened and every package in the case weighed, and the lightest and the heaviest weight packages were bought and taken to the Connecticut Agricultural experiment Station for further examination.

No.	Brand	Packers	Lightest Weight (In Grams)	Heaviest Weight (In Grams)
1 - 2	Magne's Fine Quality Red Kidney Beans	Fredonia Preserving Co.	691	728
3 - 4	Magne's Fine Quality Lima Beans	Fredonia Preserving Co.	689	718
5 - 6	Spring Beans	Gibb's Preserving Co.	625	648
7 - 8	Butter Nut Fancy Quality Refugee Beans	Fredonia Preserving Co.	671	697
9 - 10	Magne's Fine Quality Cut Yellow Wax Beans	Fredonia Preserving Co.	678	698
11 - 12	Butter Nut Fancy Quality Green Lima Succotash	Fredonia Preserving Co.	651	713
13 - 14	Magne's Fine Quality Sweet Corn	Fredonia Preserving Co.	697	719
15 - 16	Northern Queen Sweet Sugar Corn	The F. C. Bushnell Co. Distributors	684	699
17 - 18	Van Camp's Spaghetti Al'italienne	The Van Camp Packing Co.	699	718
19 - 20	Butter Nut Fancy Quality Hand Packed Tomatoes	Fredonia Preserving Co.	611	703
21 - 22	Triacan Lombard Plums	The F. C. Bushnell Co. Distributors	693	711
23 - 24	Del Monte Extra Quality Colossal Green Asparagus	California Fruit Canners Assc.	1031	1075
25 - 26	Royal Hawaiian Sliced Pineapple	Haiker Fruit & Packing Co.	730	783
27 - 28	Butter Nut Fancy Quality Fancy Corn	Fredonia Preserving Co.	679	696
29 - 30	Butter Nut Fancy Quality Golden Wax Beans	Fredonia Preserving Co.	682	703
31 -32-33	Magne's Fine Quality Succotash	Fredonia Preserving Co.	609 659	713
34 - 35	Magne's Fine Quality Sweet Wrinkled Peas	Fredonia Preserving Co.	703	720
36 - 37	Magne's Fine Quality Cut Refugee Beans	Fredonia Preserving Co.	675	699
38 - 39	Del Monte Extra Quality Green Asparagus Tips	California Fruit Canners Assc.	564	590
40 - 41	Butter Nut Fancy Quality Cherry Beets	Fredonia Preserving Co.	683	720
42 - 43	Butter Nut Fancy Quality Little Gem Sifted Peas	Fredonia Preserving Co.	697	708
44 - 45	Triacan Bartlett Pears	The F. C. Bushnell Co. Distributors	656	715
46 - 47	Oval Extra White Cherries	The Booth Packing Co.	658	706
48 - 49	Selected Mushrooms, First Choice	Von Bremen Asche & Co.	505	531
50 - 51	Mushrooms	Pucis & Stems	495	518
52 - 53	Van Camp's Pork and Beans with Tomato Sauce	The Van Camp Packing Co.	716	740
54 - 55	Butter Nut Columbia River Spring Salmon	The F. C. Bushnell Co. Distributors	503	546

No.	Brand	Packers	Lightest Weight	(In Grams)	Heaviest Weight
56 - 57	Butter Nut Columbia River Spring Salmon	The F. C. Bushnell Co. Distributors	282		302
58 - 59	Franco American Soups, Mock Turtle		588		611
60 - 61	Campbell's Tomato Soup	Joseph Campbell Co.	385		404
62 - 63	Jumbo Pie Peaches	Miller Bros. & Co.	1032		1074
64 - 65	California Packing Company's Yellow Peaches	Golden Gate Packing Co.	979		1023
66 - 67	California Packing Company's Bartlett Pears	Golden Gate Packing Co.	975		1030
68 - 69	California Packing Company's Royal American Cherries	Golden Gate Packing Co.	1011		1050
70 - 71	California Packing Co's. Sliced Lemon Cling Peaches	Golden Gate Packing Co.	992		1034
72 - 73	Cooked Corn Beef (size 1)	Libby, McNeill & Libby	434		450
74 - 75	Cooked Corn Beef (Size 2)	Libby, McNeill & Libby	816		858
76 - 77	Lunch Tongue	Libby, McNeill & Libby	460		494
78 - 79	Chicken (No. 1 size)	Richardson & Robbins	455		490
80 - 81	Potted Beef, Ham Flavor, Meat Product, (Size ¼) Added	Libby, McNeill & Libby	141		150
82 - 83	Potted Meat, Beef, Ham Flavor, (Size ½)	Libby, McNeill & Libby	225		235
84 - 85	Beech Nut Sliced Bacon	Beech Nut Packing Co.	576		610
86 - 87	Beech Nut Beef (Large Jar)	Beech Nut Packing Co.	541		575
88 - 89	Butter Nut Fancy Quality Spring Spinach	Fredonia Preserving Co.	1079		1109
90 - 91	Snider's Process Pork and Beans with Tomato Sauce	The T. A. Snider Preserve Co.	725		742
92 - 93	Golden Pumpkin, Solid Dry Packed	U. H. Dudley & Co.	1204		1226
94 -95-96	Pimentos Morrones Red Peppers, Carmen Brand	United Pure Food Co. Distributors	505	529	595
97 - 98	Alaska Red Salmon, Hume's Karliek Brand	Alaska Packers' Association	571		597
99 - 100	Pimentos Morrones Red Peppers, Carmen Brand		276		298
101 - 102	Herrings in Tomato Sauce	Marshall & Co.	650		698
103 - 104	Kippered Herrings	Marshall & Co.	635		654
105 - 106	Underwood's Clams, Extra Quality	Wm. Underwood Co.	531		553
107 - 108	Pleasant River Brand Maine Clams	H. S. Kane	521		543
109 - 110	"Creole" Brand Barabaria Shrimp	Pelican & Lake Oyster & Pack. Co.	359		377
111 - 112	Mt. Washington Imperial Medium Maple Sap Syrup	Bay State Maple Syrup Co.	864		937
113	Strawberry Jelly	Logan Johnson & Co.		612	
114	Apple Jelly	Logan Johnson & Co.		650	
115	Raspberry Jelly	Logan Johnson & Co.		620	
116	Apple Jelly	Logan Johnson & Co.		640	

No.	Brand	Packers	Lightest Weight (In Grams)	Heaviest Weight
117	Pineapple Jelly	Logan Johnson & Co.	654	
118	Plum and Apple Jelly	Logan Johnson & Co.	642	
119 - 120	Two Dozen Tumblers Assorted Jelly	Logan Johnson & Co.	469	498
121 - 122	Mueller's Egg Noodles, Standard Flag Brand		264	284
123 - 124	Three Dozen, One Pound, Straight Macaroni	The Freihofer V. B. Co.	426	508
125 - 126	Maryland Special Brand Tomatoes	Phillips Packing Co.	1048	1080
127 - 128	Half Moon Brand Hand Packed Tomatoes	The F. C. Bushnell Co. Distributors	1102	1190
129 - 130	Red Fox Brand Solid Tomatoes	Packed for the Wm. H. Geer Co.	1029	1092
131 - 132	Magne's Fancy Quality Golden Pumpkin	Fredonia Preserving Co.	1068	1094
133 - 134	25 1 lb. Packages Butter Alimentary Paste Mezzani	The F. C. Bushnell Co.	468	502
135 - 136	I Doz. 1 lb. Freihofer's Egg Elbow Spaghetti	The Freihofer Vienna Baking Co.	452	490
137 - 138	2 Doz. 1 lb. Freihofer's Egg Elbow Macaroni	The Freihofer Vienna Baking Co.	455	487
139 - 140	Freihofer's Egg Noodle Medium	The Freihofer Vienna Baking Co.	277	295
141 - 142	3 Doz. Kellog's Toasted Corn Flakes (Standard Size)		320	393
143 - 144	2 Doz. 1½ lbs. Pkgs. Reliable Prepared Flour Self Raising		705	713
145 - 146	1½ Doz. Packages Quaker Oats		682	705
147 - 148	18 Cartons, (Small) Hecker's Grandma's Pancake Flour		950	960
149 - 150	Rolled Buffalo Oats		870	950
151 - 152	Quaker Toasted Corn Flakes (3 Doz. Packages)		336	350
153 - 154	Serv-us Brand Cleaned Currants	Serv-us Pure Food Co.	418	444
155 - 156	The Very Best Prunes, Gold Medal Brand		368	400
157 - 158	Butter Nut Fancy Evaporated Apples	The F. C. Bushnell Co. Distributors	432	452
159 - 160	Butter Nut Fancy Seeded Raisins	The F. C. Bushnell Co. Distributors	442	452
161 - 162	Dunham's Original Shred Cocoanut		122	153
163 - 164	Dunham's Original Shred Cocoanut		251	307
165 - 166	Fish Flakes, Corned Codfish and Haddock	Burnham & Morrill Co.	267	345
167 - 168	Azum Crab Extra Fancy	S. Azum	562	585
169 - 170	Union Brand Preserved Strawberries	Platt & Co.	385	400
171 - 172	Cleveland's New Process Yellow Split Peas	The Cleveland Seed Co.	473	485
173 - 174	Crisco	The Proctor & Gamble Co.	803	822
175 - 176	Anger's Golden Seal Macaroni		187	217
177 - 178	Sphinx Brand Vermicelle	Miner, Read & Tullock	465	479
179 - 180	Jell-O Ice Cream Powder, Strawberry	The Genesee Pure Food Co.	152	162
181 - 182	Tryphosa	E. C. Rich	207	231

No.	Brand	Packers	Lightest Weight (In Grams)	Heaviest Weight (In Grams)
183 - 184	Monogram Brand Dates	William Hills, Jr.	376	427
185 - 186	Compass Brand String Beans	D. E. Foote & Co.	628	669
187 - 188	Natural Artichokes, Liberta's Brand	Palermo, Italy	745	809
189 - 190	Cirios Peeled Tomatoes	Napoli, Italy	555	628
191 - 192	Franco American Puree of Tomato	Franco American Food Co.	288	302
193 - 194	Square Brand Condensed Skim Milk	Hire's Condensed Milk Co.	704	711
195 - 196	Van Camp's Evaporated Milk	The Van Camp Packing Co.	213	218
197 - 198	Magnolia Brand Condensed Milk	Borden's Condensed Milk Co.	478	485
199 - 200	Snider's Cocktail Sauce	The Snider Preserving Co.	490	505
201 - 202	Durkee's Salad Dressing	R. R. Durkee & Co.	245	258
203 - 204	None Such Mince Meat	Merrell Soule	327	332
205 - 206	Aunt Dinah's Brand Pure New Orleans Molasses	Penick & Ford	958	998
207 - 208	Mammoth Selected Queen Olives, Nutmeg Brand	Packed for Miner, Reed & Tullock	990	1017
209 - 210	Spanish Olives, Nutmeg Brand Selected Queen Olives	Packed for Miner, Read & Tullock	995	1029
211 - 212	Selected Spanish Olives, Nutmeg Brand Stuffed with Spanish Sweet Peppers		357	373
213 - 214	Selected Queen Olives, Nutmeg Brand, Small Size		642	660
215 - 216	Royal Baking Powder (½ Lb.)		288	299
217 - 218	Royal Baking Powder (¼ Lb.)		150	156
219 - 220	Beech Nut Brand Peanut Butter		397	435
221 - 222	Compound Pure Comb Honey	Chas. Israel & Bros.	360	376
223 - 224	Blue Label Tomato Ketchup	Curtice Bros. Co.	893	915
225 - 226	Nutmeg Brand Fancy Sugar Syrup Blended of Cane and Maple Sugar Syrup		501	512
227 - 228	Karo	Corn Products Refining Co.	1013	1028
229 - 230	William's Chili Sauce	The Williams Bros. Co.	483	505
231 - 232	William's Tenpenny Chow Chow Pickles		482	497
233	Rosebud Cherries, Colored and Flavored	Rheinstram Bros.	1572	
234 - 235	William's Tenpenny Sweet Gherkins Pickles	The Williams Bros. Co.	478	504
236 - 237	William's Tenpenny Sweet Fancy Mixed Pickles	The Williams Bros. Co.	486	504
238 - 239	William's Sweet Relish	The Williams Bros. Co.	564	595
240 - 241	Van Camp's Sterilized Evaporated Milk	The Van Camp Packing Co.	552	562
242 - 243	Hecker's Cream Farina	Hecker-Jones-Jewell Mill Co.	989	1010

Under Chapter 137 of Public Acts of 1907, as amended by Chapter 189 of Public Acts of 1911, the Department has examined 5366 dairies, or places where cattle, dairy stock, or other domestic animals are kept within this state, for the purpose of ascertaining whether any insanitary conditions exist which would be liable to effect the product of such farm or dairy. 748 of these places were found to be in such an insanitary condition that the occupants were notified to remove or abate those insanitary conditions within the next thirty days, or the sale of any product of such dairy or place would be prohibited, and after said thirty days had expired and a second inspection had been made there were found to be twenty who had refused or neglected to comply with the order to clean up, and the sale of any milk or milk products was prohibited until such time as they had fully complied with the previous order. Of this number only one had to be prosecuted for selling his product. The following is the list of those who refused or neglected to comply with the order to clean up until after the sale of their product had been prohibited:—

Howard Harrison	Branford
J. J. Stent	Branford
John Zuwalick	Branford
Willian Curran	Bridgeport
Isaac Goldstein	Bridgeport
J. H. Thornton	Coventry
Wm. H. Miles	Goshen
Austin Wadham	Goshen
Edgar W. Lane	Guilford
E. T. Harris	Litchfield
Helen Ford	Middletown
Hubert Holcomb	New Hartford
Clifford Street	New Haven
A. D. Lewis	Southbury
George R. Hart	Southington
P. A. Allen	Sprague
Warren C. Randall	Stonington
Jared Gallup	Voluntown
Miles H. Whetmore	Winchester
W. L. Nash	Winchester

There have been 158 samples of molasses taken since the last report was published, and all have been found to comply with the Connecticut Pure Food Laws.

A general inspection of the bakeries, restaurants, hotels and boarding houses has been made under Sections 2559 and 2560 of the General Statutes. 895 of these places have been inspected and a few prosecutions have been brought under the law referred to above.

No.
4680 E
5097 E
5098 E
5099 E
5131 E
5220 P
5236 P
6123 L

6128 E

No.
4923 P

5343 V

6181 E

4903 E
4906 E
4907 P
4921 E

PRINT BUTTER

No.	Dealer	Location	Violation	Manufacturer
	M. C. Dingwall	New Haven	Short weight	
4902	H. J. Spencer	Mystic	Net weight not on package	Swift & Co.
4902A	H. B. Lamb	Mystic	Net weight not on package	
5143	City Hall Grocery	Hartford	Net weight in small type	Yorkshire Creamery Co.
5346	W. J. Bartlett	Putnam	Net weight not on package	
5342	J. Hesler & Co.	Putnam	Net weight not on package	J. Hesler & Co.
6110	George Mitchell	Torrington	Short weight	Torrington Creamery Geo. Wiegold, Prop.
6110A	George Mitchell	Torrington	Short weight	
6110B	George Mitchell	Torrington	Short weight	
6111	George Mitchell	Torrington	Short weight	
6111A	George Wiegold	Torrington	Short weight	
6111B	George Wiegold	Torrington	Short weight	
6118	Benjamin Yalofsky	Torrington	Net weight not on package	
6119	Great A. & P. Tea Co.	New Haven	Net weight not on package	
6119A	Schoenberger & Sons	New Haven	Net weight not on package	
6119B	Schoenberger & Sons	New Haven	Net weight not on package	
6126	Bernard Keevers	Windsor Locks	Net weight not on package	
6126A	O. L. Dart	Suffield	Net weight not on package	
6126B	O. L. Dart	Suffield	Net weight not on package	
6127	The Model Market Co.	Waterbury	Short weight	Yorkshire Creamery Co.
6144	W. J. Bartlett	Putnam	Net weight not on package	
6179	The Hartford Market Co.	Hartford	Short weight	Morris & Co.
6180	Morris & Co.	Hartford	Short weight	

BUTTER AND OLEOMARGINE

No.	Dealer	Location	Bought for	Result of Analysis	
4681	Palmer Bros	Naugatuck	Oleomargarine	Oleomargarine	
4925	The Model Market Co.	Waterbury	Butter	Oleomargarine	
4826	The Model Market Co.	Waterbury	Butter	Oleomargarine	
4927	The Model Market Co.	Waterbury	Butter	Oleomargarine	
4928	Joseph S. Farley	Waterbury	Butter	Renovated	
4929	Gervais Bros.	Waterbury	Butter	Oleomargarine	
5141	Harry Scherer	South Norwalk	Renovated	Renovated	
5153	Joe Isenberg	Bridgeport	Butter	Butter	
5154	Board of Health	Bridgeport	Butter	Butter	
5155	Board of Health	Bridgeport	Butter	Butter	
6104	J. G. Beck	New Haven	Oleomargarine	Oleomargarine	
6108	A. Ballerstein	Hartford	Butter	Oleomargarine	(unofficial)
6115	Joseph S. Farley	Waterbury	Butter	Renovated	
6124	The Model Market Co.	Waterbury	Butter	Oleomargarine	
6125	Hadded Bros.	Waterbury	Renovated	Renovated	
6129	David Tan	Waterbury	Butter	Renovated	
6142	S. Gildersleeve & Sons	Gildersleeve	Butter	Butter	
6145	Louis Lafleur	Moosup	Butter	Butter	
6149	J. S. Caya & Co.	Hartford	Butter	Renovated	
6172	William H. Robinson	Norwich	Oleomargarine	Oleomargarine	
6174	Mrs. Margaret Spaulding	Norwich	Butter	Oleomargarine	Bought of Wm. Robinson for butter
6174A	Mrs. Thomas Murphy	Norwich	Butter	Oleomargarine	
6174B	Mrs. Calvin Leonard	Norwich	Butter	Oleomargarine	
6175	Barnard Sosensky	New Haven	Butter	Renovated	
6181A	F. W. Edwards	Essex	Butter	Butter	(unofficial)
6303	C. C. McCray	Hartford	Butter	Renovated	
6304	Morris Juster	Hartford	Butter	Butter	
6305	A. Abelson	Hartford	Butter	Butter	
6306	Elias Berman	Hartford	Butter	Renovated	
6307	W. S. Tracy	Hartford	Butter	Butter	
6308	Joseph Mesite	Hartford	Butter	Butter	
6309	J. S. Ruffkess	Hartford	Butter	Butter	

No.	Dealer	Location	Bought for	Result of analysis
6310	Ruben Myers	Hartford	Butter	Butter
6311	Max Markman	Hartford	Butter	Butter
6312	J. L. Roche	Hartford	Butter	Butter
6313	M. Allison	Hartford	Butter	Butter
6314	A. J. Apter	Hartford	Butter	Butter
6315	L. Barnard	Hartford	Butter	Butter
6316	N. D. Bradley	Hartford	Butter	Butter
6317	Frank Fanelli	Hartford	Butter	Butter
6319	Yale Tea & Coffee Store	Hartford	Butter	Renovated
6350	J. S. Caya Co.	Hartford	Butter	Renovated
6351	Sophia Levin	Hartford	Butter	Renovated
6352	Sarah Kramer	Hartford	Butter	Butter
6353	Morris Goldstein	Hartford	Butter	Butter
6354	Roloff Bros.	Hartford	Butter	Butter
6758	A. B. Reich & Son	Bridgeport	Renovated	Renovated

MILK

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
2362	Harry Antiuk	West Hartford	1.0314	13.26	4.5		
2363	Harry Antiuk	West Hartford	1.0309	12.90	4.3		
2364	Harry Antiuk	West Hartford	1.0314	13.86	5.0		
2365	Harry Antiuk	West Hartford	1.0314	13.02	4.3		
2366	Harry Antiuk	West Hartford	1.0312	12.61	4.0		
4173	George L. Atwood	Waterbury	1.0297	11.76	3.6		
4174	S. P. Bronson	Waterbury	1.0295	12.55	4.3		
4175	Bunnell	Waterbury	1.0300	12.79	4.4		
4675	G. H. Hawxhurst	Norwalk					Not adulterated
4676	G. H. Hawxhurst	Norwalk					Not adulterated
4677	David Jenks	Norwalk					Not adulterated
4678	David Jenks	Norwalk					Not adulterated
4679	Charles E. Hoyt	Norwalk					Not adulterated
4940	John Knieling	Colchester	1.0273	11.88	4.2	39.8	Watered
4941	Harry Chafetz	Colchester	1.0297	10.79	2.8	41.9	Below standard
4942	Harry Chafetz	Colchester	1.0325	12.82	3.9		Passed
4943	Osler Burman	Colchester	1.0279	10.58	3.0	38.5	Watered
4944	Osler Burman	Colchester	1.0265	11.31	3.9	38.6	Watered
4945	Osler Burman	Colchester	1.0274	9.97	2.6	39.1	Watered and Skimmed
4946	Hyman Coopersmith	Colchester	1.0279	12.27	4.4	40.0	Passed
4947	Hyman Coopersmith	Colchester	1.0256	10.36	3.3	37.75	Watered
4948	Hyman Coopersmith	Colchester	1.0266	11.09	3.7	39.1	Watered
4949	Hyman Coopersmith	Colchester	1.0270	10.95	3.5	39.2	Watered
4950	William Tibbetts	Yantic	1.0162	6.57	2.1		Watered
4951	William Tibbetts	Yantic	1.0175	7.26	2.4		Watered
4952	William Tibbetts	Yantic	1.0200	8.60	3.0		Watered
4953	William Tibbetts	Yantic	1.0195	8.12	2.7		Watered
4954	William Tibbetts	Yantic	1.0194	8.09	2.7		Watered
4964	L. P. Smith	Lebanon	1.0309	12.90	4.3		Passed
4965	L. P. Smith	Lebanon	1.0309	11.46	3.1	42.0	Below standard
4966	L. P. Smith	Lebanon	1.0312	11.65	3.2		Passed

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
4967	L. P. Smith	Lebanon	1.0305	12.32	3.9		Passed
4968	L. P. Smith	Lebanon	1.0299	11.45	3.3		Below standard
4969	L. P. Smith	Lebanon	1.0320	11.37	2.8		Below standard
4971	E. W. Hewitt	Lebanon	1.0329	12.68	3.7		Passed
4972	E. W. Hewitt	Lebanon	1.0321	12.84	4.0		Passed
4973	E. W. Hewitt	Lebanon	1.0317	12.98	4.2		Passed
4974	E. W. Hewitt	Lebanon	1.0320	11.73	3.1		Below standard
4975	E. W. Hewitt	Lebanon	1.0330	12.22	3.3		Passed
4976	B. Halpern	Montville	1.0284	9.98	2.4	39.5	Watered
4977	William Munson	Middlebury					
4978	William Munson	Middlebury					
4979	William Munson	Middlebury					
4980	William Munson	Middlebury					
5002	Minnie Bittin	Columbia	1.0262	9.91	2.8		Watered
5003	Minnie Bittin	Columbia	1.0245	10.93	4.0		Watered
5004	Minnie Bittin	Columbia	1.0278	9.11	1.8	39.25	Watered and Skimmed
5005	Minnie Bittin	Columbia	1.0291	10.76	2.9	41.0	Below Standard
5006	Minnie Bittin	Columbia	1.0259	9.60	2.6		Watered
5007	Minnie Bittin	Columbia	1.0278	9.59	2.2	39.3	Watered and Skimmed
5008	Minnie Bittin	Columbia	1.0268	9.70	2.5	38.5	Watered
5009	H. Levine	Columbia	1.0299	10.36	2.4		Skimmed
5010	H. Levine	Columbia	1.0299	10.60	2.6		Skimmed
5011	H. Levine	Columbia	1.0300	10.62	2.6		Skimmed
5012	H. Levine	Columbia	1.0304	10.72	2.6		Skimmed
5013	Jasper Abramsohn	Columbia	1.0300	12.43	4.1		Passed
5015	Jasper Abramsohn	Columbia	1.0273	11.52	3.9	40.2	Watered
5016	W. B. Birge	Franklin	1.0332	10.83	2.1		Skimmed
5017	W. B. Birge	Franklin	1.0321	12.60	3.8		Passed
5018	W. B. Birge	Franklin	1.0318	12.76	4.0		Passed
5020	Mrs. Mary Marshall	Ellington	1.0311	14.11	6.0		
5021	Mrs. Mary Marshall	Ellington	1.0306	15.09	6.2		
5029	Abraham Baker	Turnerville	1.0203	8.79	3.1		Watered

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
5030	Abraham Baker	Turnerville	1.0209	8.59	2.8		Watered
5031	Abraham Baker	Turnerville	1.0204	8.46	2.8		Watered
5032	Abraham Baker	Turnerville	1.0204	8.70	3.0		Watered
5033	Abraham Baker	Turnerville	1.0220	9.22	3.1		Watered
5034	Abraham Baker	Turnerville	1.0207	8.30	2.6		Watered
5035	Abraham Baker	Turnerville	1.0199	8.34	2.8		Watered
5036	Abraham Baker	Turnerville	1.0204	8.94	3.2		Watered
5037	Abraham Baker	Turnerville	1.0223	9.42	3.2		Watered
5038	Abraham Baker	Turnerville	1.0220	8.86	2.8		Watered
5039	Abraham Baker	Turnerville	1.0205	8.48	2.8		Watered
5040	Abraham Baker	Turnerville	1.0208	8.80	3.0		Watered
5041	Abraham Baker	Turnerville	1.0200	8.60	3.0		Watered
5042	M. Durst	Turnerville	1.0265	10.95	3.6		Watered
5043	Wm. Schmitz	Colchester	1.0318	13.24	4.4		Passed
5044	D. Goldstein	Turnerville	1.0264	10.20	3.0		Watered
5045	D. Goldstein	Turnerville	1.0258	9.93	2.9		Watered
5046	Abraham Mantel	Columbia	1.0258	9.93	2.9		Watered
5047	Abraham Mantel	Columbia	1.0267	10.04	2.8		Watered
5048	Abraham Mantel	Columbia	1.0244	9.46	2.8		Watered
5049	Abraham Mantel	Columbia	1.0275	9.40	2.1		Watered
5050	Abraham Mantel	Columbia	1.0251	9.88	3.0		Watered
5051	Abraham Mantel	Columbia	1.0246	9.39	2.7		Watered
5052	Abraham Mantel	Columbia	1.0251	10.12	3.2		Watered
5053	Abraham Mantel	Columbia	1.0251	9.16	2.4		Watered
5054	Abraham Mantel	Columbia	1.0264	9.24	2.2		Watered
5055	Abraham Mantel	Columbia	1.0254	9.47	2.6		Watered
5056	Abraham Mantel	Columbia	1.0246	9.87	3.1		Watered
5057	Abraham Mantel	Columbia	1.0236	9.26	2.8		Watered
5093	Herbert W. Wells	Wethersfield	1.0312	12.01	3.5		
5094	Herbert W. Wells	Wethersfield	1.0314	12.18	3.6		
5095	Herbert W. Wells	Wethersfield	1.0314	12.18	3.6		
5096	Herbert W. Wells	Wethersfield	1.0312	12.25	3.7		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
5102	Robert Slocum	Danbury	1.0314	11.82	3.3		
5103	Robert Slocum	Danbury	1.0311	11.87	3.4		
5104	Robert Slocum	Danbury	1.0301	11.86	3.6		
5105	Robert Slocum	Danbury	1.0311	12.23	3.7		
5106	Robert Slocum	Danbury	1.0304	11.57	3.3		
5107	Robert Slocum	Danbury	1.0303	11.91	3.6		
5108	Robert Slocum	Danbury	1.0315	12.45	3.8		
5109	Robert Slocum	Danbury	1.0306	12.10	3.7		
5110	Robert Slocum	Danbury	1.0311	11.99	3.5		
5111	Robert Slocum	Danbury	1.0295	11.47	3.4		
5112	Robert Slocum	Danbury	1.0300	11.71	3.5		
5113	Robert Slocum	Danbury	1.0301	11.74	3.5		
5137	F. H. Wempe	South Norwalk	1.0307	13.09	4.5		
5138	Joseph Kery	Norwalk	1.0311	11.75	3.3		
5139	Joseph Kery	Norwalk	1.0313	12.64	4.0		
5140	George Eaton	Norwalk	1.0297	13.68	5.2		
5202	Joseph Apter	West Hartford	1.0315	12.81	4.1		
5203	Joseph Apter	West Hartford	1.0325	13.31	4.3		
5204	Joseph Apter	West Hartford	1.0329	12.82	3.9		
5205	Joseph Apter	West Hartford	1.0319	13.03	4.2		
5211	John Spencer	Norwich	1.0295	12.31	4.1		Not Adulterated
5212	John Spencer	Norwich	1.0284	12.51	4.5		Not Adulterated
5213	John Spencer	Norwich	1.0271	11.35	3.8	40.1	Below Standard
5217	Silas Griffith	Killingly	1.0280	11.01	3.3	35.7	Watered
5218	Charles F. Ennis	Danielson	1.0309	12.78	4.2		
5221	Nelson Fontaine	Jewett City	1.0307	12.49	4.0		
5222	James Blanchett	Jewett City	1.0271	11.32	3.6	36.7	Below Standard
5223	James Blanchett	Jewett City	1.0286	11.48	3.6	37.3	Below Standard
5224	James Blanchett	Jewett City	1.0276	11.66	3.6	36.5	Below Standard
5226	Frank Fragano	Pomfret	1.0301	12.10	3.8		
5227	Frank Fragano	Pomfret	1.0317	12.50	3.8		
5228	Frank Fragano	Pomfret	1.0308	11.79	3.4		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
5237	Arthur Griswold	Wethersfield	1.0313	11.68	3.2		
5238	Arthur Griswold	Wethersfield	1.0322	12.74	3.9		
5239	Arthur Griswold	Wethersfield	1.0325	13.43	4.4		
5240	Arthur Griswold	Wethersfield	1.0301	11.86	3.6		
5241	W. E. Griswold	Wethersfield	1.0290	12.30	4.2		
5242	W. E. Griswold	Wethersfield	1.0317	13.34	4.5		
5243	W. E. Griswold	Wethersfield	1.0310	13.76	5.0		
5244	W. E. Griswold	Wethersfield	1.0293	12.62	4.4		
5247	Daniel Donovan	Meriden	1.0296	12.08	3.9	37.5	No Visible Dirt
5248	Daniel Donovan	Meriden	1.0300	11.94	3.7	37.2	No Visible Dirt
5249	Daniel Donovan	Meriden	1.0300	11.58	3.4	37.2	No Visible Dirt
5251	Joseph Warner	Plainfield	1.0311	13.19	4.5		
5252	Joseph Warner	Plainfield	1.0295	12.31	4.1		
5253	William Munson	Middlebury					Not Adulterated
5254	William Munson	Middlebury					Not Adulterated
5255	Stephen Dezo	Tolland	1.0277	11.34	3.6	35.8	Watered
5256	Stephen Dezo	Tolland	1.0297	11.76	3.6		
5257	Stephen Dezo	Tolland	1.0292	11.14	3.2		Below Standard
5258	Stephen Dezo	Tolland	1.0305	12.20	3.8		
5259	Stephen Dezo	Tolland	1.0305	10.95	2.7		Below Standard
5260	Stephen Dezo	Tolland	1.0284	10.70	3.0	35.0	Watered
5261	George H. Bailey	Durham	1.0262	10.73	3.4	35.0	Watered
5262	Bailey & Page	Durham	1.0275	10.48	2.9	35.8	Watered
5263	Benj. Page & Fred Page	Durham	1.0275	11.05	3.4	35.8	Watered
5264	Benj. Page & Fred Page	Durham	1.0290	11.22	3.3	36.0	Below Standard
5265	Benj. Page & Fred Page	Durham	1.0266	10.62	3.3	35.0	
5266	Benj. Page & Fred Page	Durham	1.0261	10.73	3.5	35.2	Watered
5267	George H. Bailey	Durham	1.0285	12.90	4.8	37.0	
5268	George H. Bailey	Durham	1.0290	12.66	4.5		
5279	Sidney Hagenow	South Manchester	1.0226	9.85	3.4		Watered
5280	Sidney Hagenow	South Manchester	1.0215	9.25	3.0		Watered
5281	Sidney Hagenow	South Manchester	1.0209	9.23	3.0		Watered

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
5282	James F. Wynne	Huntington	1.0319	12.07	3.4		
5283	James F. Wynne	Huntington	1.0265	10.47	3.2	35.1	Watered
5284	Sidney Hagenow	South Manchester	1.0215	10.54	3.9		Watered
5285	O. W. Mills	Windsor	1.0339	13.29	4.0		
5286	Louis Grossman	Windsor	1.0307	12.97	4.4		
5287	Louis Grossman	Windsor	1.0315	12.93	4.2		
5288	Venazio Russo	Windsor	1.0307	12.97	4.4		
5289	Venazio Russo	Windsor	1.0305	13.52	4.9		
5290	Venazio Russo	Windsor	1.0307	12.25	3.8		
5291	Venazio Russo	Windsor	1.0307	12.73	4.2		
5292	Venazio Russo	Windsor	1.0315	13.17	4.4		
5293	Venazio Russo	Windsor	1.0312	12.83	4.2		
5294	Venazio Russo	Windsor					Contained Visible Dirt
5296	Abraham Burstein	Colchester	1.0316	11.87	3.3		
5297	Abraham Burstein	Colchester	1.0314	11.70	3.2		
5298	Abraham Burstein	Colchester	1.0303	11.05	3.0	37.2	Below Standard
5299	Samuel Gitlin	Colchester	1.0291	12.57	4.4		
5300	Samuel Gitlin	Colchester	1.0302	13.20	4.7		
5301	Albert Woynar	Colchester	1.0260	10.41	3.2	35.0	Watered
5302	Catherine Konashevsky	Colchester	1.0282	11.68	3.8	37.0	Below Standard
5305	J. H. Geeson	Putnam	1.0292	11.75	3.7		
5306	J. H. Geeson	Putnam	1.0308	10.82	2.6		Below Standard
5307	Ernest Messier	Putnam	1.0303	10.82	2.7		Below Standard
5308	Ernest Messier	Putnam	1.0287	11.75	3.8		
5309	A. R. Cole	Putnam	1.0313	12.88	4.2		
5310	A. R. Cole	Putnam	1.0303	12.51	4.1		
5311	A. R. Cole	Putnam	1.0313	13.12	4.4		
5319	Chas. F. Ennis	Danielson	1.0317	12.26	3.6		
5323	Heublein Hotel	Hartford	1.0334	11.48	2.6		Skimmed
5325	James Blanchett	Jewett City	1.0286	11.48	3.6	36.6	Below Standard
5347	Bonee & Sons	East Hartford		11.31	3.2	Below standard. No preservative found	
5372	James F. Wynne	Huntington	1.0255	10.22	3.2	34.8	Watered

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
5373	James F. Wynne	Huntington	1.0259	10.68	3.5	34.5	Watered
5374	James F. Wynne	Huntington	1.0254	10.55	3.5	34.7	Watered
5375	James F. Wynne	Huntington	1.0310	12.92	4.3		
5377	John Cronin	Stonington		13.71	5.4		
5378	John Cronin	Stonington		12.95	4.3		
5379	John Cronin	Stonington		13.71	5.4		
5380	S. P. Bronson	Waterbury	1.0315	12.45	3.8		
5381	S. P. Bronson	Waterbury	1.0299	12.29	4.0		
5382	S. P. Bronson	Waterbury	1.0309	12.06	3.6		
5383	S. P. Bronson	Waterbury	1.0309	12.30	3.8		
5384	George L. Atwood	Waterbury	1.0304	12.41	4.0		
5385	George L. Atwood	Waterbury	1.0315	13.17	4.4		
5386	Ellsworth Wilcox	Stratford	1.0289	11.51	3.3	36.0	Below Standard
5387	Ellsworth Wilcox	Stratford	1.0284	11.20	3.5	36.0	Below Standard
5388	Ellsworth Wilcox	Stratford	1.0284	11.28	3.5	36.0	Below Standard
5389	Ellsworth Wilcox	Stratford	1.0284	10.82	3.2	35.9	Below standard
5390	E. H. Reed	Stratford	1.0286	10.88	3.0	36.0	Below standard
5391	E. H. Reed	Stratford	1.0289	11.24	3.4	35.9	Below standard
5392	E. H. Reed	Stratford	1.0275	11.93	4.2	35.9	Below standard
5393	E. H. Reed	Stratford	1.0276	11.43	3.7	35.9	Below standard
6000	Lawrence M. Larensen	Bloomfield	1.0277	11.50	3.8	36.2	Below standard
6001	Lawrence M. Larensen	Bloomfield	1.0270	11.23	3.8	36.0	Below standard
6002	Lawrence M. Larensen	Bloomfield	1.0275	11.45	3.8	36.3	Below standard
6003	Lawrence M. Larensen	Bloomfield	1.0275	11.08	3.5	36.0	Below standard
6005	Charles W. Fulton	West Hartford	1.0287	11.38	3.5	36.0	Watered
6006	Charles W. Fulton	West Hartford	1.0271	10.91	3.6	35.1	Watered
6007	Edward F. Peckham	West Hartford	1.0236	9.54	3.2	33.2	Watered
6008	Edward F. Peckham	West Hartford	1.0255	10.24	3.3	34.3	Watered
6009	H. J. Wickham, Owner Woodland Farm	Hartford	1.0315	13.29	4.5		
6010	H. J. Wickham, Owner Woodland Farm	Hartford	1.0309	12.66	4.1		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum		
6011	H. J. Wickham, Owner Woodland Farm	Hartford	1.0317	12.26	3.6			
6061	George H. Campana	Bridgeport	1.0287	13.67	5.4			
6062	Charles M. Bassett	Bridgeport	1.0271	11.35	3.8	36.5	No preservative.	Below standard
6063	Charles M. Bassett	Bridgeport	1.0283	11.65	3.8	37.5	No preservative.	Below standard
6064	Sam Smuelowitz	Bridgeport	1.0268	11.14	3.7	36.1	No preservative.	Below standard
6065	Wm. B. Meyer	Bridgeport	1.0257	9.96	3.2	35.3	No preservative.	Watered
6066	Angelo Piccardo	Bridgeport	1.0257	9.96	3.1	35.3	No preservative.	Watered
6068	Charles J. Wolff	Bridgeport	1.0293	11.78	3.7			
6070	Angelo Risi	Bridgeport	1.0290	11.34	3.4		No preservative.	Below standard
6071	Philip H. Baum	Bridgeport	1.0306	12.58	4.1			
6072	Roger Farm Dairy	Bridgeport	1.0278	10.42	3.0	36.5	No preservative.	Below standard
6073	Gaza Hidu	South Norwalk	1.0276	10.58	3.1	35.8	No preservative.	Watered
6074	Gaza Hidu	South Norwalk	1.0296	10.40	2.5	36.8	No preservative.	Below standard
6075	Willis L. Bean	South Norwalk	1.0292	10.90	3.0	36.5	No preservative.	Below standard
6076	Willis L. Bean	South Norwalk	1.0272	10.38	3.0	35.6	No preservative.	Watered
6077	George Eaton	South Norwalk	1.0286	12.08	4.1	37.0		
6078	George Eaton	South Norwalk	1.0275	12.17	4.4	37.0		
6079	William C. Ryan	South Norwalk	1.0288	11.53	3.6	37.5	No preservative.	Below standard
6080	The R. H. Nesbitt Co.	New Haven	1.0304	12.65	4.2			
6081	Arthur Tennant	New Haven	1.0308	12.15	3.7			
6082	Adam Duhan	New Haven	1.0314	11.82	3.3			
6083	Adam Duhan	New Haven	1.0312	11.28	2.9	38.8	No preservative.	Below standard
6084	Mrs. H. A. Chadburn	New Haven	1.0288	11.29	3.4	37.0	No preservative.	Below standard
6085	W. G. Graves & Son	New Haven	1.0276	10.41	2.9	36.2	No preservative.	Below standard
6087	S. S. Adams	New Haven	1.0306	12.46	4.0			
6088	S. S. Adams	New Haven	1.0290	11.70	3.7		No preservative.	Below standard
6091	Willard M. Lovell	Windsor	1.0311	13.75	5.0			
6092	Willard M. Lovell	Windsor	1.0320	13.38	4.3			
6093	Mrs. M. J. Moore	Windsor	1.0322	13.76	5.1			
6094	Mrs. M. J. Moore	Windsor	1.0307	12.89	4.2			
6095	Frank W. Barber	Windsor	1.0303	13.72	5.0			

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6096	Frank W. Barber	Windsor	1.0313	13.48	4.7		
6097	Franklin L. Knox	East Weatogue	1.0210	8.88	3.0	31.3	Watered
6098	Franklin L. Knox	East Weatogue	1.0275	11.78	4.0	35.6	Watered
6099	Franklin L. Knox	East Weatogue	1.0267	11.65	4.1	35.6	Watered
6099A	Franklin L. Knox	East Weatogue	1.0265	10.65	3.3	34.9	Watered
6102	Louis Joseloff	South Norwalk	1.0305	11.96	3.6		
6103	John H. Crosby	South Norwalk	1.0297	11.76	3.6		
6103A	John H. Crosby	South Norwalk	1.0302	12.48	4.1		
6109	John Accornero	Glastonbury	1.0319	11.83	3.2		Below standard
6109A	John Accornero	Glastonbury	1.0264	10.80	3.5	35.1	Watered
6120	Assad & Galy	Norwich	1.0304	11.95	3.4		
6121	James Ellis	Norwich	1.0309	12.83	4.2		
6130	Charles Addison	Bloomfield	1.0308	13.47	4.8		Not adulterated
6131	Charles Addison	Bloomfield	1.0312	13.57	4.8		Not adulterated
6132	S. S. Green	New Milford	1.0313	12.76	4.1		
6132A	A. E. Bostwick	New Milford	1.0296	12.45	4.2		
6134	H. W. Welles	Wethersfield	1.0302	11.88	3.6		
6135	H. W. Welles	Wethersfield	1.0288	12.37	4.3		
6136	H. W. Welles	Wethersfield	1.0291	11.85	3.8		
6137	H. W. Welles	Wethersfield	1.0307	12.25	3.8		
6137A	E. B. Wilcox	Stratford	1.0296	12.81	4.5		Not adulterated
6138	John E. Wells	New Milford	1.0319	13.03	4.2		
6139	A. E. Bostwick	New Milford	1.0317	13.22	4.4		
6140	Patrick McGarry	New Milford	1.0242	11.12	4.4	35.2	Watered
6150	Frank Germain	Wallingford	1.0301	11.63	3.5		No preservative. Below standard
6151	Frank Germain	Wallingford	1.0303	12.24	3.9		No preservative
6152	Frank Germain	Wallingford	1.0303	11.99	3.6		No preservative
6157	Thomas F. Millard	Norwalk	1.0209	11.04	4.5	32.4	Watered
6158	Thomas F. Millard	Norwalk	1.0214	11.00	4.4	32.5	Watered
6159	Frank E. Adams	Colchester	1.0162	7.29	2.7	28.7	Watered
6160	Frank E. Adams	Colchester	1.0169	7.35	2.6	29.0	Watered
6160A	Smith Cleveland	Lakeville	1.0306	13.18	4.6		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6161	Smith Cleveland	Lakeville	1.0301	11.98	3.7		
6162	Smith Cleveland	Lakeville	1.0282	11.62	3.8	37.2	Below standard
6163	W. O. Wooster	Naugatuck	1.0389	12.16	4.1		
6164	W. O. Wooster	Naugatuck	1.0290	12.18	4.1		
6165	Peter Lawson	Naugatuck	1.0266	11.65	4.2	35.2	Watered
6166	Peter Lawson	Naugatuck	1.0266	11.62	4.2	35.1	Watered
6200	P. H. Christie	Newington	1.0317	12.02	3.4		
6201	P. H. Christie	Newington	1.0316	12.47	3.8		
6279	George L. Bunnell	Northford	1.0223	9.54	3.1	32.9	Watered
6280	George L. Bunnell	Northford	1.0250	10.22	3.2	34.8	Watered
6318	Louis Sansone	Branford	1.0270	11.59	3.7	35.0	Watered
6320	John O'Brien	Colchester	1.0272	12.33	4.6	36.5	
6321	Wilson G. Arents	Woodbridge	1.0232	9.76	3.3	33.9	Watered
6322	Wilson G. Arents	Woodbridge	1.0246	9.82	3.1	34.3	Watered
6323	John Luggarea	Orange	1.0295	14.12	5.6		
6340	C. A. Hills	Hebron	1.0235	10.92	4.2	35.8	Watered
6341	C. A. Hills	Hebron	1.0222	10.47	4.1	35.6	Watered
6342	C. A. Hills	Hebron	1.0238	10.03	3.4	34.8	Watered
6343	C. A. Hills	Hebron	1.0227	9.40	3.1	33.8	Watered
6344	Arthur Bailey	Durham	1.0294	12.76	4.5		
6345	G. H. Bailey	Durham	1.0293	12.38	4.2		
6346	G. H. Bailey	Durham	1.0286	11.36	3.5	36.4	Below standard
6347	Arthur Bailey	Durham	1.0308	11.79	3.4		
6355	John Feeley	Bloomfield	1.0321	15.14	5.9		
6356	John Feeley	Bloomfield	1.0324	13.40	4.4		
6357	John Feeley	Bloomfield	1.0335	14.04	4.7		
6358	John Feeley	Bloomfield	1.0315	14.02	5.1		
6359	B. Fleischer	Hartford	1.0318	12.04	3.4		Not adulterated
6360	B. Fleischer	Hartford	1.0332	13.11	4.0		Not adulterated
6361	M. L. Stoddard	Newington Junc.	1.0317	12.86	4.1		
6362	M. L. Stoddard	Newington Junc.	1.0319	12.91	4.1		
6363	M. L. Stoddard	Newington Junc.	1.0314	12.66	4.0		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6364	J. W. Camp	Newington Junc.	1.0335	14.28	4.9		
6365	J. W. Camp	Newington Junc.	1.0327	14.20	5.0		
6373	R. B. Anderson	Cheshire	1.0203	7.94	2.4	31.2	Watered
6374	R. B. Anderson	Cheshire	1.0200	7.44	2.0	31.1	Watered
6405	John G. Murphy	Norwalk	1.0298	13.58	5.1		
6426	K. Bercowetz	Bloomfield	1.0315	12.93	4.2		
6427	K. Bercowetz	Bloomfield	1.0318	12.64	3.9		
6535	Edward S. Cole	North Branford	1.0283	11.53	3.7	37.0	Below standard
6536	Edward S. Cole	North Branford	1.0304	11.57	3.3	38.0	Below standard
6557	Mrs. J. Sands	Woodbridge	1.0228	10.58	4.1	32.8	Watered
6599	B. Fleischer	Hartford	1.0327	13.23	4.2		Not adulterated
6603	Joseph Bysskiwies	Orange	1.0310	13.40	4.7		
6604	Joseph Bysskiwies	Orange	1.0271	10.38	3.0	35.5	Watered
6605	Patrick J. Hayes	Orange	1.0306	12.94	4.4		
6606	Patrick J. Hayes	Orange	1.0260	10.94	3.7	34.6	Watered
6700	George Eaton	South Norwalk	1.0257	10.75	3.6	34.0	Watered
6701	George Eaton	South Norwalk	1.0259	10.79	3.6	34.0	Watered
6702	Edward S. Stevenson	South Norwalk	1.0291	14.71	6.2		
6703	Edward S. Stevenson	South Norwalk	1.0352	11.81	2.5		Skimmed
6704	Frederick H. Wempe	South Norwalk	1.0284	10.46	2.8	36.3	Below standard
6705	Frederick H. Wempe	South Norwalk	1.0275	10.48	3.0	35.6	Watered
6706	Frederick H. Wempe	South Norwalk	1.0252	9.78	2.9	34.6	Watered
6768	Fred Corf	North Branford	1.0289	12.78	4.6	36.9	No preservative
6795	Santo Canato	Middletown	1.0281	12.56	4.6		
6796	Santo Canato	Middletown	1.0244	10.54	3.7	34.4	Watered
6797	Mrs. Georgianna Wyllie	Rocky Hill	1.0290	12.42	4.3		Watered
6798	Mrs. Georgianna Wyllie	Rocky Hill	1.0290	12.18	4.1		
6799	H. I. Wildman	Winchester	1.0250	11.29	4.2	34.2	Watered
6800	William Curran	Bridgeport					
6803	John Cronin	Pawcatuck	1.0300	12.67	4.3		
6804	John Cronin	Pawcatuck	1.0303	11.31	3.1		Below standard
6855	Santo Canato	Middletown	1.0207	8.66	2.9	31.1	Watered

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6856	Santo Canato	Middletown	1.0219	9.20	3.1	32.3	Watered
6857	Santo Canato	Middletown	1.0216	8.52	2.6	32.0	Watered
6858	W. H. Wyllie	Rocky Hill	1.0229	9.09	2.8	33.0	Watered
6859	W. H. Wyllie	Rocky Hill	1.0235	9.48	3.0	33.4	Watered
6860	Charles J. Harris	Middletown	1.0261	10.85	3.6	35.6	Watered
6861	Charles J. Harris	Middletown	1.0269	11.53	4.0	36.2	Suspicious; below standard
6862	Charles J. Harris	Middletown	1.0266	10.97	3.6	35.9	Watered
6863	Charles J. Harris	Middletown	1.0226	9.13	2.9	33.4	Watered
6864	Charles J. Harris	Middletown	1.0271	11.11	3.6	36.1	Suspicious; below standard
6865	Charles J. Harris	Middletown	1.0261	10.73	3.5	35.3	Watered
6866	August Lietke	Middletown	1.0284	11.43	3.6	36.4	Below standard
6867	August Lietke	Middletown	1.0294	9.75	2.0	36.1	Partially skimmed; below standard
6868	August Lietke	Middletown	1.0279	12.03	4.2		Passed
6870	B. L. Barker	Branford	1.0310	11.84	3.4		
6871	John W. Nichols	Branford	1.0310	12.44	3.9		
6872	John W. Nichols	Branford	1.0298	13.46	5.0		
6873	George Eaton	Norwalk	1.0264	12.25	4.7	36.8	Passed
6874	James Kery	South Norwalk	1.0277	10.77	3.2	35.8	Watered
6875	James Kery	South Norwalk	1.0286	11.48	3.6	36.5	Below standard
6876	James Kery	South Norwalk	1.0281	11.75	3.1	36.0	Below standard
6877	James Kery	South Norwalk	1.0309	11.83	3.4		
6878	George Eaton	Norwalk	1.0294	13.36	5.0		
6879	Frederick H. Wempe	South Norwalk	1.0263	12.23	4.7	36.2	Passed
6880	Frederick H. Wempe	South Norwalk	1.0280	10.96	3.3	37.0	Below standard
6881	Frederick H. Wempe	South Norwalk	1.0280	11.93	4.1		
6882	Frederick H. Wempe	South Norwalk	1.0267	10.64	3.3	36.2	Below standard
6883	V. Malinauskas	Seymour	1.0257	10.39	3.3	33.8	Watered
6884	V. Malinauskas	Seymour	1.0312	12.37	3.8		
6885	V. Malinauskas	Seymour	1.0305	11.60	3.3		Below standard
6886	V. Malinauskas	Seymour	1.0298	12.74	4.4		
6887	Chas. Huenerberg	Westport	1.0309	12.78	4.2		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6888	Chas. Huenerberg	Westport	1.0313	12.64	4.0		
6889	Chas. Huenerberg	Westport	1.0312	12.49	3.9		
6891	O. D. & P. M. Tuthill	Greenwich	1.0318	12.04	3.4		
6892	O. D. & P. M. Tuthill	Greenwich	1.0303	12.87	4.4		
6893	O. D. & P. M. Tuthill	Greenwich	1.0324	12.43	3.6		
6894	O. D. & P. M. Tuthill	Greenwich	1.0306	12.46	4.0		
6895	O. D. & P. M. Tuthill	Greenwich	1.0322	12.02	3.3		
6896	O. D. & P. M. Tuthill	Greenwich	1.0312	12.85	4.2		
6897	O. D. & P. M. Tuthill	Greenwich	1.0319	12.67	3.9		
6898	O. D. & P. M. Tuthill	Greenwich	1.0319	12.79	4.0		
6899	Santa Canato	Middletown	1.0259	10.20	3.1	34.9	Watered
6900	Leverett P. Judd	West Hartford	1.0241	10.35	3.6	34.3	Watered
6901	Leverett P. Judd	West Hartford	Soured				
6902	Leverett P. Judd	West Hartford	Soured				
6903	Leverett P. Judd	West Hartford	Soured				
6904	Leverett P. Judd	West Hartford	Soured				
6905	Leverett P. Judd	West Hartford	Soured				
6906	Leverett P. Judd	West Hartford	Soured				
6907	Hiram J. Gilbert	West Hartford	Soured				
6908	Hiram J. Gilbert	West Hartford	Soured				
6909	Jas. E. Wallbeoff	Wethersfield	1.0302	12.96	4.5		
6910	Jas. E. Wallbeoff	Wethersfield	1.0287	12.71	4.6		
6911	Jas. E. Wallbeoff	Wethersfield	1.0288	11.16	3.3	36.2	Below standard
6912	Jacob Appelbaum	Rocky Hill	1.0304	12.17	3.8		
6913	Jacob Appelbaum	Rocky Hill	1.0299	12.77	4.4		
6914	Thomas Dillon	Rocky Hill	1.0290	12.78	4.6		
6915	Thomas Dillon	Rocky Hill	1.0314	13.26	4.5		
6916	Frederick H. Bacon	Rocky Hill	1.0303	12.39	4.0		
6917	Frederick H. Bacon	Rocky Hill	1.0305	13.16	4.6		
6918	Frederick H. Bacon	Rocky Hill	1.0310	12.56	4.0		
6919	Henry A. Potter	Putnam	1.0309	11.94	3.5		
6920	Ernest Messier	Putnam	1.0324	12.43	3.6		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6921	Azare Paquin	Putnam	1.0281	12.08	4.2		
6922	Nelson Lefebre	Putnam	1.0311	13.31	4.6		
6923	Paul Varieur	Putnam	1.0339	11.01	2.1		Below standard in solids and fat
6924	Albert Langelier	Putnam	1.0318	12.52	3.8		
6925	Kasper Hoppman	Jewett City	1.0308	13.23	4.6		
6926	Kasper Hoppman	Jewett City	1.0308	12.63	4.1		
6927	Kasper Hoppman	Jewett City	1.0310	13.28	4.6		
6950	H. I. Wildman	Winchester	1.0273	11.40	3.8	35.6	Watered
6951	George Slater	Stafford Springs	1.0268	11.14	3.7	36.2	Below standard. Suspicious
6952	George Slater	Stafford Springs	1.0266	10.85	3.5	35.3	Watered
6953	George Slater	Stafford Springs	1.0263	11.02	3.7	35.2	Watered
6954	George Slater	Stafford Springs	1.0257	11.47	4.2	35.0	Watered
6955	Mrs. Minnie Pulser	Stafford Springs	1.0239	11.98	5.0	35.0	Watered
6956	Mrs. Minnie Pulser	Stafford Springs	1.0234	11.73	4.9	34.6	Watered
6957	Mrs. Minnie Pulser	Stafford Springs	1.0242	10.85	4.0	34.3	Watered
6958	Mrs. Minnie Pulser	Stafford Springs	1.0242	10.85	4.0	34.4	Watered
6959	Mrs. Minnie Pulser	Stafford Springs	1.0268	12.94	5.2	36.3	Suspicious
6960	Mrs. Minnie Pulser	Stafford Springs	1.0252	8.92	2.2	35.4	Watered
6961	Azare Paquin	Putnam	1.0285	11.70	3.8		Below standard
6962	Napoleon Varieur	Putnam	1.0301	11.62	3.4		Below standard
6963	Napoleon Varieur	Putnam	1.0300	11.95	3.7		
6964	Napoleon Varieur	Putnam	1.0301	11.74	3.5		Below standard
6965	Napoleon Varieur	Putnam	1.0307	12.61	4.1		
6966	Napoleon Varieur	Putnam	1.0305	12.08	3.7		
6967	Azare Paquin	Putnam	1.0286	13.40	5.2		
6968	Nelson Lefebre	Putnam					Sample curdled
6969	Nelson Lefebre	Putnam	1.0308	13.35	4.7		
6970	L. P. Judd	West Hartford	1.0294	11.19	3.2		Below standard
6971	L. P. Judd	West Hartford	1.0289	12.28	4.2		
6972	L. P. Judd	West Hartford	1.0289	11.56	3.6		Below standard
6973	L. P. Judd	West Hartford	1.0290	11.34	3.4		Below standard
6974	L. P. Judd	West Hartford	1.0290	12.06	4.0		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
6975	L. P. Judd	West Hartford	1.0304	12.41	4.0		
6976	L. P. Judd	West Hartford	1.0289	11.32	3.4		Below standard
6977	L. P. Judd	West Hartford	1.0289	11.92	3.9		
6978	Richard Smythe	Beacon Falls	1.0302	12.84	4.4		
6979	Richard Smythe	Beacon Falls	1.0309	13.02	4.4.		
6980	Richard Smythe	Beacon Falls	1.0308	13.11	4.5		
6981	Richard Smythe	Beacon Falls	1.0300	12.79	4.4		
6982	Richard Smythe	Beacon Falls	1.0304	12.77	4.3		
6983	Richard Smythe	Beacon Falls	1.0304	12.77	4.3		
6984	Mazulis Zubaski	Somers	1.0207	9.02	3.2		Watered
6985	Mazulis Zubaski	Somers	1.0174	6.75	2.0		Watered
6986	Mazulis Zubaski	Somers	1.0223	8.70	2.6		Watered
6987	Mazulis Zubaski	Somers	1.0218	9.53	3.4		Watered
6988	Mazulis Zubaski	Somers	1.0163	6.96	2.4		Watered
6989	Mazulis Zubaski	Somers	1.0192	8.40	3.0		Watered
6990	Mazulis Zubaski	Somers	1.0219	9.44	3.3		Watered
6991	Mazulis Zubaski	Somers	1.0245	11.53	4.5	33.5	Watered
6992	Mazulis Zubaski	Somers	1.0249	10.79	3.8		Watered
6993	Frank K. Gowdy	Scitico	1.0214	10.15	4.0		Watered
6994	Frank K. Gowdy	Scitico	1.0252	10.62	3.6		Watered
6995	Frank K. Gowdy	Scitico	1.0227	10.24	3.8		Watered
6996	H. A. Button	Suffield	1.0300	12.19	3.9		
6997	H. A. Button	Suffield	1.0305	12.44	4.0		
6998	H. A. Button	Suffield	1.0304	13.01	4.5		
6999	H. A. Button	Suffield	1.0309	13.26	4.6		
7001	H. A. Button	Suffield	1.0299	12.41	4.1		
7002	H. A. Button	Suffield	1.0301	12.58	4.2		
7003	H. A. Button	Suffield	1.0308	12.87	4.3		
7004	H. A. Button	Suffield	1.0303	12.15	3.8		
7005	H. A. Button	Suffield	1.0318	13.12	4.3		
7006	H. A. Button	Suffield	1.0303	13.23	4.7		
7007	Henry J. Apley	Putnam	1.0326	12.48	3.6		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
7008	Henry J. Apley	Putnam	1.0308	12.63	4.1		
7009	Henry J. Apley	Putnam	1.0322	12.38	3.6		
7010	Albert Morin	Putnam	1.0285	12.42	4.4		
7011	Albert Morin	Putnam	1.0287	12.95	4.8		
7012	Albert Morin	Putnam	1.0283	13.08	5.0		
7013	Albert Morin	Putnam	1.0285	12.42	4.4		
7014	Howard Brown	Putnam	1.0314	12.30	3.7		
7015	Howard Brown	Putnam	1.0308	11.79	3.4		
7016	Howard Brown	Putnam	1.0314	10.97	2.6		Skimmed
7017	Howard Brown	Putnam	1.0317	12.98	4.2		
7018	C. E. Simons	Putnam	1.0314	11.70	3.2		
7019	Frank O. Potter	Putnam	1.0307	13.45	4.8		
7020	W. C. Many	Torrington	1.0280	12.53	4.6	35.5	
7021	Daniel Ryan	Torrington	1.0276	13.03	5.1	36.4	
7022	Daniel Ryan	Torrington	1.0287	11.88	3.9	36.2	
7023	A. H. Williams	Woodstock	1.0305	11.96	3.6	36.2	
7024	A. H. Williams	Woodstock	1.0309	12.66	4.1	38.7	
7025	A. H. Williams	Woodstock	1.0300	12.07	3.8	37.0	
7026	A. H. Williams	Woodstock	1.0292	13.19	4.9	38.0	
7027	Harris L. Sanger	Woodstock	1.0310	11.84	3.4	37.1	
7028	Harris L. Sanger	Woodstock	1.0299	12.05	3.8	37.5	
7029	David Fleming	Greenwich	1.0315	12.69	4.0		
7030	David Fleming	Greenwich	1.0314	12.78	4.1		
7031	David Fleming	Greenwich	1.0304	12.65	4.2		
7032	Geo. E. Schmaling	East Portchester	1.0286	12.44	4.4	36.0	
7033	Geo. E. Schmaling	East Portchester	1.0289	11.44	3.5	36.0	Below standard
7034	Geo. E. Schmaling	East Portchester	1.0304	12.29	3.9		
7035	Geo. E. Schmaling	East Portchester	1.0309	12.30	3.8		
7036	Overlook Dairy	Greenwich	1.0313	13.60	4.8		
7037	Overlook Dairy	Greenwich	1.0293	12.14	4.0	36.1	
7038	George Smith	West Haven	1.0313	12.28	3.7		
7039	George Smith	West Haven	1.0306	11.98	3.6		
7040	George Smith	West Haven	1.0311	11.87	3.4		
7041	George Smith	West Haven	1.0311	11.99	3.5		
7042	George Smith	West Haven	1.0310	11.96	3.5		

No.	Name of Dealer	Location	Sp. Gr.	Total Solids	Fat	Serum	
7043	George Smith	West Haven	1.0315	12.33	3.7		
7044	Arthur Luciani	Woodbridge	1.0206	8.80	3.0	31.5	Watered
7045	August Preain	West Haven	1.0266	10.97	3.6	35.3	Watered
7046	August Preain	West Haven	1.0271	11.11	3.6	36.2	Below standard
7100	H. W. Wells	Wethersfield	1.0281	12.32	4.4	37.8	
7101	H. W. Wells	Wethersfield	1.0300	12.43	4.1		
7102	H. W. Wells	Wethersfield	1.0317	12.62	3.9		
7103	H. W. Wells	Wethersfield	1.0308	12.51	4.0		
7104	H. W. Wells	Wethersfield	1.0293	11.78	3.7	38.0	
7105	Geo. Cadaire	Rocky Hill	1.0309	12.42	3.9		
7106	Otto Neuman	Rocky Hill	1.0326	12.96	4.0		
7107	C. S. Gilbert	Rocky Hill	1.0311	12.59	4.0		
7108	C. S. Gilbert	Rocky Hill	1.0326	12.60	3.7		
7109	C. S. Gilbert	Rocky Hill	1.0315	11.97	3.4		
7110	C. S. Gilbert	Rocky Hill	1.0315	12.45	3.8		
7111	C. S. Gilbert	Rocky Hill	1.0305	12.56	4.1		
7112	C. S. Gilbert	Rocky Hill	1.0309	12.54	4.0		
7113	Anson F. Graniss	Litchfield	1.0311	13.31	4.6	37.2	
7114	Anson F. Graniss	Litchfield	1.0307	13.93	5.2	37.8	
7115	J. B. Cradduck	Stratford	1.0282	10.91	3.4	35.1	Watered
7116	J. B. Cradduck	Stratford	1.0282	10.86	3.4	35.1	Watered
7117	J. B. Cradduck	Stratford	1.0317	11.96	3.4	37.3	
7118	J. B. Cradduck	Stratford	1.0309	12.29	4.1	36.1	Suspicious
7119	J. T. Hart	Stratford	1.0311	12.81	4.6	37.4	
7120	J. T. Hart	Stratford	1.0311	11.77	3.4	37.1	
7121	H. Bohling	Essex	1.0332	13.60	4.4	37.2	
7122	H. Bohling	Essex	1.0326	12.60	3.7	37.0	
7123	H. Bohling	Essex	1.0316	12.71	4.0	37.1	
7124	H. Bohling	Essex	1.0320	13.05	4.2	37.2	
7125	L. J. Cooper	North Haven	1.0301	12.58	4.2	36.2	
7126	L. J. Cooper	North Haven	1.0306	11.50	3.2	36.2	

SKIM MILK

6413	Mrs. John Hoffman	Middletown	1.0301	7.56	0.13	35.0	Watered
6414	Mrs John Hoffman	Middletown	1.0312	7.84	0.21	35.9	Watered

CITRATE OF MAGNESIA

			Grams per 100 cc.			
No.	Dealer	Location	Magnesia	Potash	Strength	Remarks
5210	S. N. Rubin	Hartford	0.86	0.19		Below standard
6366	J. A. Caryl	New Haven	1.73	0.33		
6369	Goldberg's Pharmacy	New Haven	0.94	0.23		Below standard
6382	Nichols & Harris Co.	New London	1.12	0.39	70% U. S. P.	Below standard
6386	West Side Drug Store	Norwich	1.25	0.36	78% U. S. P.	Below standard
6559	Victor W. Schmelzer	Meriden	1.71	0.38		
6564	John M. Rosenthal	Hartford	1.07	0.38	66.9% U. S. P.	Below standard
6568	Charles Scherp	New Britain	1.43	0.26		Below standard
6583	E. M. Roberts	Waterbury	1.72	0.48		
6587	Henry Picarelli	Waterbury	1.24	0.38	77.5% U. S. P.	Below standard
6588	Joseph A. Urba	Waterbury	1.26	0.26		Below standard
6598	Doran's Drug Store	Danbury	1.76	0.31		

OLIVE OIL

No.	Dealer	Location	Refraction at 15.5 degrees	Remarks
4904	Samuel Chesbro	Willimantic	1.4699	No cotton seed, or peanut oils present. Sesame oil doubtful. Passed.
4909	N. L. Morris	New Haven	1.4702	No cotton seed, sesame or peanut oils present. Passed.
4911	P.Dorato	New Haven		Passed.
4955	H. Glendenning & Co.	Norwalk	1.4701	No cotton seed, sesame, or peanut oils present. Passed.
4958	Stillson Powell Co.	So. Norwalk	1.4701	No cotton seed or peanut oils present. Sesame oil doubtful. Passed.
5116	Johnson & Bros. Inc.	New Haven		No cotton seed or sesame oil.
6177	Giacomo Cuneo	So. Norwalk		Contains no cotton seed oil.
6178	Giacomo Cuneo	So. Norwalk		Contains cotton seed oil.

POWDERED ASAFOETIDA

No.	Dealer	Location	Alcohol Soluble	Ash
6367	Est. of C. Fleischner	New Haven	13.52	63.83
6368	Chas. S. Leete & Co.	New Haven	25.36	43.80
6388	A. L. Ambree	Stamford	34.28	49.33
6397	P. N. Holley	Bristol	21.40	49.12
6558	W. W. Mosher	Meriden	26.00	46.24
6565	J. S. Kauffman	Hartford	15.26	66.94
6566	F. L. Palmer's Drug Store	Hartford	36.58	37.17
6567	L. Howard Tracy	Hartford	11.58	47.08
6569	E. L. Janswick	New Britain	26.26	64.18
6585	J. W. Cone	Waterbury	12.20	66.88

The above samples were all adulterated in that they contained a great excess of ash, and a great deficiency of alcohol-soluble matter.

SWEET SPIRITS OF NITRE

No.	Dealer	Location	Ethyl Nitrate	Remarks
4905	J. J. Hickey & Co.	Willimantic	3.16%	Below standard
4922	C. E. Pickard & Co.	Bridgeport	2.57	Below standard
4933	C. E. Miller	Hartford	3.36	Below standard
4934	Halloran's Drug Store	New Britain	3.43	Below standard
4935	City Drug Store	New Britain	2.67	Below standard
4936	The Miller-Hanson Drug Co.	New Britain	3.51	Below standard
4937	Arcade Drug Store	New Britain	0.25	Below standard
4957	Edward P. Weed	Norwalk	3.09	Below standard
4959	Frank H. Baxter	South Norwalk	2.65	Below standard

MEATS

No.	Sample of	Dealer	Location	Starch	Sulphurous Acid mgms. per 100 gms.	Remarks
6370	Sausage	H. Swirsky	New Haven	3.14	—	
6371	Frankfurts	Paul Hunger	New Haven			
6372	Frankfurts	Pfaff & Son	New Haven			
6375	Frankfurts	Alois Schwab	New Haven	1.73	—	
6376	Frankfurts	Alois Schwab	New Haven	1.22	—	
6377	Frankfurts	Mrs. K. Hertler	New Haven	3.83	0.3	Coal-tar color (Ponceau)
6378	Sausage	Soltz Co.	New London	0.18	6.6	
6379	Sausage	Geo. M. Chapin	New London	2.35	—	
6380	Sausage	Harrigan Bros.	New London	0.08	—	
6381	Frankfurts	N. L. Public Market	New London	0.02	—	
6383	Sausage	Somers Bros.	Norwich	0.07	—	
6384	Sausage	Rumford & Co.	Norwich	0.23	—	
6385	Frankfurts	Mrs. R. Thum	Norwich	2.86	—	
6387	Sausage	G. O. Hathaway	Norwich	2.59	—	
6389	Sausage	Public Market	So. Norwalk	0.88	—	
6390	Sausage	Homer S. Beers & Co.	Norwalk	0.12	—	
6391	Sausage	F. A. State	Norwalk	0.11	—	
6392	Frankfurts	Frank Romano	So. Norwalk	4.73	—	Coal-tar color
6393	Sausage	Atlantic & Pacific Tea Co.	Willimantic	5.61	—	
6394	Sausage	Mullen & St. Onge	Willimantic	2.48	—	
6395	Sausage	E. W. Harrington	Rockville	0.14	—	
6396	Sausage	H. J. Bingenheimer	Rockville	0.50	—	
6537	Sausage	Harry Langer	Greenwich	2.24	3.1	
6538	Sausage	P. G. Sipf	Greenwich	Trace	2.0	
6539	Frankfurts	Edward E. Lewis	Greenwich	3.22	1.2	Amaranth, permitted color
6540	Hamburg Steak	Lord & Weir	Stamford	—	1.7	
6541	Sausage (bulk)	Lord & Weir	Stamford	Trace	1.2	
6542	Sausage (case)	Lord & Weir	Stamford	1.14	0.8	
6543	Frankfurts	T. M. McGee	Stamford	2.36	0.4	
6544	Sausage	D. I. Garff	Stamford	2.41	1.7	
6545	Sausage (case)	G. S. Tracy	Hartford	1.23	1.1	

No.	Sample of	Dealer	Location	Starch	Sulphurous Acid mgms. per 100 gms.	Remarks
6546	Sausage (case)	John J. McAuliffe	Hartford	2.12	0.9	
6547	Sausage (case)	Public Market	Hartford	1.80	1.8	
6548	Frankfurts	Eastern Provision Co.	Hartford	6.43	1.7	
6549	Sausage	Toney's Market	Hartford	1.58	1.4	
6550	Sausage	Katzenstein Bros.	Hartford	Trace	2.2	
6551	Frankfurts	D. McNamara	Bridgeport	4.33	1.7	
6552	Sausage	A. Herzog	Bridgeport	3.97	0.9	
6553	Sausage (bulk)	E. L. Sullivan	Bridgeport	0.20	0.9	
6554	Sausage (bulk)	T. A. Healey	Bridgeport	0.49	0.9	
6555	Sausage (case)	Bridgeport Public Market	Bridgeport	2.32	1.7	
6556	Sausage (bulk)	Bridgeport Public Market	Bridgeport	Trace	1.2	
6560	Sausage	Maurice O'Brien	Meriden	3.01	3.2	
6561	Frankfurts	C. F. Fox & Son	Meriden	3.20	2.6	
6562	Sausage	W. Strange	Meriden	0.50	1.8	
6563	Sausage	M. B. Liedki	Wallingford	6.35	1.3	
6570	Frankfurts	Malosske	New Britain	3.64	2.3	Coal-tar color
6571	Sausage	Anger & Giard	New Britain	4.64	—	
6572	Frankfurts	D. Fichman	New Britain	6.56	2.0	
6573	Sausage	J. F. Colehan	New Britain	1.01	—	
6574	Frankfurts	Peter Feifer	Ansonia	0.31	—	
6575	Sausage	U. H. Barrett	Ansonia	2.73	—	
6576	Sausage	W. A. Fenn	Shelton	2.48	—	
6577	Sausage	A. C. Christensen & Co.	Derby	0.20	—	
6578	Sausage	K. Povilaites	Union	2.02	—	
6579	Frankfurts	John E. Bohlin	Naugatuck	4.62	—	
6580	Sausage	Naugatuck Cash Market	Naugatuck	2.09	—	
6581	Sausage	D. J. Coleman	Seymour	0.38	—	
6582	Sausage	Mohican Co.	Waterbury	0.72	—	
6584	Bologna	Dauch & Weir	Waterbury	3.10	1.9	
6586	Liverwurst	John Herrman	Waterbury	0.35	—	
6589	Sausage	Jos. Baltrush	Waterbury	2.17	—	
6590	Sausage	J. A. Warner	Winsted	0.24	—	

No.	Sample of	Dealer	Location	Starch	Sulphurous Acid mgms. per 100 gms.	Remarks
6591	Sausage	D. J. O'Mera	Winsted	0.51	—	
6592	Sausage	Standard Market	Torrington	0.36	—	
6593	Frankfurts	Dwan Bros.	Torrington	5.00	—	
6594	Sausage	New York Market	Danbury	0.06	—	
6595	Sausage	A. Jardon	Danbury	0.06	9.4	
6596	Sausage	Michael DiPalma	Danbury	Not analyzed as it was decomposed and unfit for human food		
6597	Kolboss	F. A. Hall	Danbury	0.07	—	

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RICE

No.	Dealer	Location	Total Ash	Ash Insoluble in
6324	Spencer & Pierpont	Waterbury	0.57	0.14
6325	F. I. Fabricant	Waterbury	0.48	0.11
6326	Foucault & Roberge	Danbury	0.38	0.04
6327	M. H. Smith	Norwich	0.41	0.06
6328	Wray & Co. Inc.	New London	1.03	0.55
6329	Sovereign Trading Co.	New Britain	0.39	0.02
6330	Great Western Market	New Britain	0.33	0.05
6331	Miller & Olson	New Britain	0.45	0.08
6332	C. L. Morgan	New Britain	0.72	0.29
6333	A. Francis & Son	Bristol	0.30	0.02
6334	Mills Tea & Butter Co.	Bristol	0.50	0.09
6336	William Hellar	New Haven	0.44	0.05
6338	E. Schoenberger & Sons	New Haven	0.37	0.03
6339	Johnson Bros.	New Haven	0.37	0.06
6851	Bielfield & Thayer	Middletown	0.44	0.08
6852	Atlantic & Pacific Tea Co.	Middletown	0.06	0.29
6853	Middletown Cash Grocery	Middletown	0.37	0.03
6854	McBride & Co.	Meriden	0.36	0.05

Acid	Remarks
	Ash powdery; talc present
	Ash powdery;
	Fused ash
	Ash powdery with some fusion; talc present
	Ash powdery; talc present; mostly broken grains; some dirt
	Fused ash
	Ash mostly fused; sample not entirely clean
	Ash powdery
	Ash powdery; talc present
	Fused ash
	Ash mostly fused; possibly talc present; mostly broken grains
	Fused ash
	Fused ash
	Ash powdery and fused
	Fused ash
	Ash powdery; talc present; many broken grains
	Fused ash
	Fused ash

COCOA

No.	Dealer	Location	Analysis Nitrogen	 Fat	Remarks
5061	M. C. Dingwall	New Haven	3.35	27.22	Misbranded
5062	M. C. Dingwall	New Haven	3.58	24.35	Misbranded
5063	D. M. Welch & Son	New Haven	——	——	Misbranded
5065	J. & W. Cahill & Co.	New Haven	3.30	23.00	Misbranded
5341	Edward Mullan	Putnam	——	——	Misbranded
5346	Shartenberg & Robinson	New Haven	3.42	24.08	Misbranded
5347A	Edward E. Hall & Son	New Haven	3.26	31.75	Misbranded
5348	The T. R. Sadd Co.	Willimantic	3.48	22.02	Misbranded
5348A	John Gilbert & Son	New Haven	3.26	31.75	Misbranded
6013	S. W. Hurlburt Co.	New Haven	——	——	Adulterated
6014	The F. J. Markle Co.	New Haven	——	——	Misbranded
6046	H. Isenberg & Co.	Bridgeport.	——	——	Misbranded

An inspection of the Concentrated Commercial Feeding Stuffs on sale in Connecticut has been made and about 70 grain and feed stores have been visited in different sections of the state, and this department finds that the manufacturers are complying with the law which requires them to state on the label the amount of fat and protein contained in such feeds.

ICE CREAM

No.	Dealer	Location	Flavor	Fat, %	
5118	Charles Musante	Waterbury	Vanilla	9.0	
5119	N. Y. Ice Cream Co.	Waterbury	Vanilla	3.0	
5120	Pete Hannis	Waterbury	Vanilla	3.75	
5121	The Harris Hart Co.	New Haven	Vanilla	9.0	
5122	Yale Ice Cream Co.	New Haven	Vanilla	2.0	
5123	Benjamin Frankel	New Haven	Vanilla	2.75	
5124	Cummings Bros.	New Haven	Strawberry	7.5	
5125	The Olympia Candy Co.	New Haven	Strawberry	9.25	
5126	Joseph Fraulo	New Haven	Vanilla	3.0	
5127	Nicola M. DePascale	New Haven	Vanilla	2.0	
5128	D. Boschen	New Haven	Strawberry	10.0	Contains an unpermitted coal tar color
5129	W. F. Hasselbach	New Haven	Vanilla	8.75	
5130	W. F. Hasselbach	New Haven	Chocolate	9.5	
5135	Semon Ice Cream Co.	New Haven	Vanilla	10.00	
5136	New Haven Dairy Co.	New Haven	Vanilla	7.75	
5145	New Haven Dairy Co.	New Haven	Strawberry	11.83	
6769	Booth & Reichert	Bridgeport	Vanilla	7.75	
6770	Jacob Huber	Bridgeport	Vanilla	13.00	
6771	Wadham	Bridgeport	Vanilla	13.75	
6772	E. L. Graves	Bridgeport	Vanilla	12.50	
6773	C. D. Lane	Bridgeport	Vanilla	17.50	
6774	Trott Bakery Co.	Waterbury	Vanilla	9.00	
6775	R. F. Worden & Sons	Waterbury	Vanilla	15.50	
6776	Thomas Kelley Co., Inc.	Waterbury	Vanilla	10.00	
6777	Joslin & Allen	Waterbury	Vanilla	8.50	
6779	New Haven Dairy Co.	New Haven	Vanilla	12.00	
6780	Greek American Fruit Co.	New Haven	Vanilla	10.00	
6781	Est. of B. Frankel	New Haven	Vanilla	1.00	
6782	Harris Hart Ice Cream Co.	New Haven	Vanilla	8.00	
6783	Cummings Bros.	New Haven	Vanilla	9.50	
6784	William Hasselbach	New Haven	Vanilla	14.50	
6785	Geo. A. Levecque	New Haven	Vanilla	10.50	
6786	Olympia Candy Co.	New Haven	Vanilla	10.50	
6787	Olympia Candy Co.	New Haven	Vanilla	10.50	
6788	F. A. Hauff	New Haven	Vanilla	10.50	
6789	Hyler	New Haven	Vanilla	18.50	
6790	Hillman Bros.	New Haven	Vanilla	10.25	
6791	Yale Ice Cream Co.	New Haven	Vanilla	3.00	
6792	Fred Rose	New Haven	Vanilla	11.00	
6793	Damaro Antimo	New Haven	Vanilla	4.00	
6794	John Semon	New Haven	Vanilla	13.00	

CREAM

No.	Kind	Dealer	Location	Remarks
5151	Pasteurized	Mitchell's Dairy	Bridgeport	Contained no preservative.
5152	Pasteurized	Mitchell's Dairy	Bridgeport	Contained no preservative.
5271	Light	New Haven Dairy	New Haven	Contains neither gelatine nor sucrate of lime.
5272	Heavy	New Haven Dairy	New Haven	Contains neither gelatine nor sucrate of lime.
5273	Heavy	New Haven Dairy	New Haven	Contains neither gelatine nor sucrate of lime.
5274	Heavy	New Haven Dairy	New Haven	Contains neither gelatine nor sucrate of lime.
5275	Heavy	New Haven Dairy	New Haven	Contains neither gelatine nor sucrate of lime.
5318		Heublein Hotel	Hartford	Contained 49.71% fat.
5321	Heavy	Heublein Hotel	Hartford	Contained 50.70% fat.
5322	Light	Heublein Hotel	Hartford	Contained 20.00% fat.
6067		Isaac Moorey	Bridgeport	Contained 46.05% fat. Contained formaldehyde.
6069		E. G. Paddock	Bridgeport	Contained 50.13% fat. Contained formaldehyde.
6086		W. G. Graves & Son	New Haven	Contained 46.77% fat. No preservative found.
6089	48%	N. B. & F. S. Hubbell	New Haven	Below the guaranteed per cent. of butter fat.
6090	38%	N. B. & F. S. Hubbell	New Haven	Contained 41.08% fat. No preservative found.
6869		John Hoffman	Cromwell	Below standard. Contained 11.25% fat.
6890		O. D. & P. M. Tuthill	Greenwich	Contained 35.5% fat.

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CREAME

Name of Creamery	Location	President
Andover Creamery Co.	Andover	E. S. Hutchinson
Aspetuck Valley Creamery Asso.	Northville	W. C. Hine
Brooklyn Creamery	Brooklyn	P. B. Sibley
*The Bryant & Chapman Co.	Hartford	B. W. Chapman
Canton Creamery	Canton Center	Henry Humphrey
Cromwell Creamery Inc.	Cromwell	Walter Fawthorp
*Danbury Creamery & Milk Sterilizing Co.	Danbury	Herbert Judd
East Canaan Corp. Creamery	East Canaan	C. H. Sage
*East Haddam Creamery Co.	East Haddam	Wm. O. Peck
Goshen	West Goshen	H. H. Ives
Granby Co-operative Creamery Co	Granby	Geo. O. Beach
The Jewett City Creamery Co.	Jewett City	E. A. Geer
Lebanon Creamery Co.	Lebanon	Geo. H. Hewitt
Ned's Brook Creamery Co.	Canton	James Case
Plainville Creamery	Plainville	Wm. Manchester
Simsbury Dairy Co.	West Simsbury	C. P. Case
Somers Creamery Co.	Somers	M. P. Avery
*Suffield Creamery Co.	Suffield	George A. Peckham
Tunxis	Robertsville	Arthur B. Ferry
Vernon Creamery Co.	Rockville	A. O. Thrall
Wapping Creamery Co.	Wapping	Chas. M. Johnson
**Winsted Creamery	Winsted	E. Manchester & S

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*Incorporated
**Proprietary
All others co-operative

IES

Secretary	Superintendent	Butter Maker	Capital
gar D. White		Louis Bebee	$ 4000
B. Hatch	V. B. Hatch	J. A. Devaux	1500
R. Thurber	A. J. Lathrop	A. J. Lathrop	3750
M. Bryant			50000
F. Case	J. H. Crowley	J. H. Crowley	4000
C. Martin	H. C. Martin	H. C. Martin	2800
cius H. Boughton			
S. Roberts	E. S. Roberts	D. E. King	3500
A. Russell	C. A. Russell	W. T. Hurd	3950
H. Wadhams	H. H. Ives	E. Wetmore	3000
F. Holcomb	O. B. Cotton	O. B. Cotton	3500
C. Bliss	B. C. Bliss	B. C. Bliss	4000
tto L. Pultz	Otto L. Pultz	Otto L. Pultz	3400
M. Gladwin	J. M. Gladwin	J. M. Gladwin	1125
B. Tucker	L. B. Tucker	L. M. Lauridsen	4000
T. Stockwell	S. T. Stockwell	Jas. O. Case	2500
W. M. Cushman	W. M. Cushman	Chas. R. Counter	4500
Arthur Sikes	Theron M. Totman	Theron M. Totman	5000
H. P. Deming	H. P. Deming	F. W. Moore	2500
A. W. Annis	A. W. Annis	A. J. Hunt	3500
Chas. J. Dewey	John M. Williams	Donald Johnson	3500

ns.

EXPENSES

Salary of Commissioner		$4000 00
Office and Traveling Expenses		3021 16
George T. Fowler, Special Inspector		3389 47
W. J. Warner, Special Inspector		2644 10
J. J. Merwin, Special Inspector		876 00
W. F. Potter, Special Inspector		460 39
Salary of Deputy Commissioner		3200 00
Traveling Expenses of Deputy and cash paid		2659 33
Total		$20250 45
Cash received for oleomargarine signs		255 95
Cash paid for oleomargarine signs	$111 19	
Cash paid to State Treasurer	144 76	255 95

CONCLUSION

The work of this department has increased very rapidly during the last four or five years, and has increased the work of the Connecticut Agricultural Experiment Station very largely, but they have always been ready to do the work imposed upon them by this office and the laws of this state without a murmur, although their appropriation from the state for their work has not been sufficient to carry it on.

I take this opportunity to thank the director and chemists of the Connecticut Agricultural Experiment Station for their advice and assistance in conducting the work of this department.

I wish to express my appreciation of the way the public and the press have co-operated with me in my efforts to enforce the Dairy and Pure Food Laws.

I desire to thank all the court officials who have co-operated with me in my attempt to help the consumers to buy purer and better food stuffs.

Respectfully submitted,

HUBERT F. POTTER,
Dairy and Food Commissioner.

State of Connecticut

PUBLIC DOCUMENT No. 38

BIENNIAL REPORT

OF

COMMISSIONER ON DOMESTIC ANIMALS

TO

THE GOVERNOR

For the Two Years Ended September 30, 1912

PRINTED IN COMPLIANCE WITH STATUTE

HARTFORD
Published by the State
1912

PUBLICATION

APPROVED BY

THE BOARD OF CONTROL

THE TORRINGTON PRINTING COMPANY
TORRINGTON, CONN.

State of Connecticut

OFFICE OF THE

Commissioner on Domestic Animals

Rooms 17 and 19, Capitol
HARTFORD

HEMAN O. AVERILL, Commissioner
Washington Depot, Conn.

BURT K. DOW, V. S., Deputy Commissioner
Willimantic, Conn.

ESTHER L. ALLEN, Clerk and Stenographer

To His Excellency, Simeon E. Baldwin, Governor of the State of Connecticut.

Sir: In compliance with the law I have the honor to submit herewith my report for the two fiscal years that closed September 30, 1912.

Very respectfully,
HEMAN O. AVERILL,
Commissioner on Domestic Animals.

RECORDS.

The following is a summary of the records of this department for the two years ended September 30, 1912.

	1911	1912
Number of calls received to examine cattle,	641	671
Number of towns from which these calls came,	129	132
Number of cattle examined in responding to these calls,	3,522	3,791
Number of inspections were none were condemned,	202	192
Number of cattle condemned.	556	661
Average price allowed per head,	$12.11	$11.17
Total amount allowed for condemned cattle,	$6,746.00	$7,382.50
Office and traveling expenses,	747.55	906.54
Veterinarians, services and expenses, including examination for glanders,	2,164.07	2,088.15
Clerk,	714.00	741.00
Expenses of Deputy Commissioner,		768.18

IMPORTATION OF CATTLE.

Number of cattle reported to this office as having been brought into Connecticut during the two years ended September 30th, 1912.

Month	Cows	Heifers	Oxen	Steers	Bulls	Calves	Totals
1910							
October,	283	75	2	—	7	25	392
November,	145	39	—	15	7	30	236
December,	42	15	—	—	4	3	64
1911							
January,	54	10	2	—	2	7	75
February,	4	4	2	—	2	—	12
March,	200	14	26	106	5	12	363
April,	70	53	14	15	13	2	167
May,	211	73	2	20	14	42	362
June,	137	75	4	2	8	19	245
July,	85	5	24	—	6	37	157
August,	190	51	7	6	28	18	300
September,	144	41	10	3	23	52	273
Totals,	1565	455	93	167	119	247	2646

IMPORTATION OF CATTLE—Continued.

Month	Cows	Heifers	Oxen	Steers	Bulls	Calves	Totals
1911							
October,	216	34	1	15	16	40	322
November,	211	—	—	3	7	20	241
December,	182	—	1	19	11	68	281
1912							
January,	214	4	4	48	36	10	316
February,	166	10	—	56	36	45	313
March,	159	13	17	81	15	15	300
April,	90	15	32	62	7	115	321
May,	177	105	16	49	50	137	534
June,	146	48	7	20	119	9	349
July,	227	79	6	28	58	29	427
August,	380	18	3	28	17	—	446
September,	261	25	7	4	21	1	319
Totals,	2429	351	94	413	393	489	4169

SUMMARY OF TWO YEARS' WORK.

The following table shows the number of calls received. the number of cattle examined, the number condemned and the total amount allowed for cattle during each month of the two fiscal years ended September 30, 1912.

Month.	Calls Rec'd	No. Examined	No. Condemned	Total All'd
1910				
October,	50	186	41	$487.00
November,	60	527	71	837.50
December,	63	480	38	511.50
1911				
January,	45	305	33	421.00
February,	32	169	14	137.00
March,	58	442	49	518.50
April,	54	305	45	496.00
May,	71	355	73	908.00
June,	51	330	55	673.50
July,	44	150	45	59[illegible].50
August,	62	277	54	668.00
September,	51	242	38	497.50
Totals,	641	3,522	556	$6,746.00

SUMMARY OF TWO YEARS' WORK—Continued.

1911 Month.	Calls Rec'd	No. Examined	No. Condemned	Total All'd
October,	64	359	60	$594.00
November,	72	443	84	841.50
December,	82	518	68	823.00
1912				
January,	58	304	62	702.50
February,	50	312	51	544.00
March,	56	397	35	392.50
April,	54	369	63	794.00
May,	45	237	41	443.50
June,	45	224	47	531.50
July,	50	263	49	561.50
August,	60	236	69	786.00
September,	35	129	32	368.50
	671	3,791	661	$7,382.50

SUMMARY OF THIRTEEN YEARS' WORK.

Number of cattle condemned each month during each of the past thirteen fiscal years, ending respectively September 30th:

Year End.	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
Oct.,	9	21	11	18	40	43	64	63	65	67	78	41	60
Nov.,	9	22	17	21	35	46	60	82	80	55	77	71	84
Dec.,	8	24	28	28	44	37	48	65	74	53	56	38	68
Jan.,	11	11	12	24	31	48	45	71	56	63	54	33	62
Feb.,	3	9	9	19	31	27	28	49	34	36	50	14	51
March,	9	22	21	26	43	53	32	40	56	46	46	49	35
April,	5	24	14	29	31	59	38	56	43	39	55	45	63
May,	15	13	28	22	32	42	35	51	36	46	39	73	41
June,	11	28	17	16	20	34	37	26	28	31	36	55	47
July,	19	13	16	21	18	12	32	25	8	37	25	45	49
Aug.,	12	24	22	23	24	40	24	34	40	41	39	54	69
Sept.,	7	6	20	35	30	46	36	50	50	37	33	38	32
Totals,	118	217	215	282	379	487	479	612	570	551	588	556	661

LOCALITIES.

Number of towns in each county from which calls to examine cattle have been received during each of past thirteen fiscal years ending respectively September 30th:

County	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
Hartford,	12	18	21	19	22	23	25	24	25	22	23	23	25
New Haven,	8	11	8	13	13	12	8	10	13	18	11	13	14
New London,	9	13	17	19	18	19	21	21	20	19	21	21	21
Fairfield,	7	11	8	12	16	17	12	13	15	13	11	13	16
Windham,	9	13	14	14	14	13	15	14	13	13	14	16	15
Litchfield,	13	8	17	18	22	19	19	19	21	19	20	23	23
Middlesex,	8	8	8	11	9	11	7	9	8	10	11	11	8
Tolland,	5	9	6	11	10	11	11	13	13	10	12	8	10
Totals,	71	91	99	117	124	125	118	123	128	124	123	128	132

Number of cattle condemned in each county during each of the past thirteen fiscal years, ending respectively September 30th:

County	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
Hartford,	20	32	26	16	49	74	62	88	71	53	47	46	36
New Haven	12	6	8	22	17	22	13	18	39	51	35	51	54
New London	9	56	40	57	85	116	104	158	130	127	183	172	229
Fairfield,	7	16	5	6	11	13	11	14	32	14	15	25	47
Windham,	18	40	74	85	105	119	121	151	150	152	171	137	127
Litchfield,	34	32	34	39	53	78	85	87	75	80	79	46	82
Middlesex,	9	12	17	31	33	34	34	49	28	43	31	49	45
Tolland,	9	23	11	26	26	31	49	47	45	31	27	30	41
Totals,	118	217	215	282	379	487	479	612	570	551	588	556	661

THIRTEEN YEARS' WORK COMPARED.

The following table shows the number of cattle examined, the number condemned, the total amount allowed for same and the average price allowed per head during each of the past thirteen fiscal years:

Year Ending Sept. 30	Number examined	Number condemned	Total Allowed	Average per head
1900	385	118	$1,802.00	$15.27
1901	825	217	3,294.50	15.18
1902	1,127	215	2,851.50	13.26
1903	1,606	282	3,797.50	13.47
1904	2,581	379	4,936.00	12.96
1905	3,603	487	6,070.00	12.56
1906	4,319	479	5,451.50	11.46
1907	5,853	612	6,582.00	10.75
1908	4,695	570	6,223.50	11.62
1909	4,518	551	6,461.50	11.72
1910	4,672	586	6,774.50	11.50
1911	3,522	556	6,746.00	12.11
1912	3,791	661	7,382.50	11.17

It is very clearly shown by the foregoing tables that there has been a fairly constant increase in the number of tuberculous cattle condemned during the past thirteen years in all seasons of the year and in all sections of the state. This great increase has of course largely increased the total amount allowed each year, but the average price paid per head has been gradually but consistently lowered from $15.27 in 1900 to $11.17 during the past fiscal year. Particular attention is called to the fact that during this period of thirteen years, when the average price allowed for condemned cattle has been by the efforts of the commissioner decreased 27 per cent., the average market price of dairy cattle in this state has increased more than 33⅓ per cent. The commissioner has been publicly and privately criticized for so persistently pursuing this policy of lowering the price paid for condemned cattle in the face of a constant upward tendency in the market price of dairy animals and of beef.

The farmer, the health officer and the inspector consistently argue that the very low price allowed owners for diseased cattle by the commissioner tends to dissuade them from reporting suspicious cases of bovine tuberculosis in the earlier stages of the disease to this department for examination, but rather encourages them to either keep the cattle in their herd just as long as they yield enough milk to pay their board, or esle sell them to the dealer of cheap beef for a price greater than the commissioner would allow. They also rightly claim that the danger to a diseased animal's herd-mates and to the consumer of its milk increases rapidly in the later stages of the disease and that the prevention of the spread of bovine tuberculosis and the protection of the public health alike demand that tuberculous cattle should be condemned and destroyed just as soon as the disease can be diagnosed by a "competent physical examination" as required by General Statutes, Sec. 4374. Such arguments as these should appeal with favor to the the wise legislators who make the laws to protect the public health and appropriate the money to pay for condemned cattle, but the commissioner can only approve bills to the amount of the appropriations and then stop the work of inspecting suspicious cases that are reported to this office, till a deficiency appropriation is made by the General Assembly.

The following table gives the amounts regularly appropriated for each of the last six fiscal two-year terms to pay for condemned cattle, and the amounts allowed by the commissioner:

	Appropriated.	Allowed.
2 years ended Sept. 30, 1901,	$ 2,000.00	$ 5,096.50
" " " " " 1903,	4,000.00	6,649.00
" " " " " 1905,	6,000.00	11,006.00
" " " " " 1907,	8,000.00	12,033.50
" " " " " 1909,	9,000.00	12,685.00
" " " " " 1911,	9,000.00	13,490.50
" " " " " 1913,	12,000.00	
1 year " " " 1912,		7,382.50

The difference between the appropriations and the amounts allowed as shown in the above table is accounted for by deficiency appropriations.

The commissioner has always refused to give to any inspector any authority to do any inspection work except to examine specific cases of suspected contagious disease that have been reported to this office by owners themselves, or by selectmen, health officers, city milk inspectors, or agents of The Connnecticut Humane Society. When such notices or calls are received the commissioner recognizes it to be his duty under Sections 4376, G. S., and Section 2, Chapter 257, P. A. 1905, to promptly examine or cause to be examined the diseased or suspected animal or animals.

During the fiscal year ended Sept. 30, 1900, the first full year of service of the present commissioner, there were received in this office 172 calls to examine suspicious cases of contagious diseases in cattle. In 1905, the general assembly passed an act entitled "An Act Concerning the Suppression of Glanders and Farcy" and placed its execution on this department. In 1907, a entirely new code of laws concerning dogs was enacted by the general assembly, and the enforcement of the same was placed on this department. Under this law it became the commissioner's duty to furnish to the several town clerks in the state the necessary dog tags with the name of the town, the registry number and the year distinctly stamped thereon, to collect pay for the same and to investigate suspicious cases of rabies and at his discretion to promulgate rules and regulations for the confinement, control or destruction of dogs. In addition to the above, requests have been made to this office to investigate suspicious cases of hog cholera, poisoning, anthrax, foot and mouth disease and malignant catarrh, and each of these diseases have been described in previous reports of the work of this department. During the past year, 895 calls have been received to examine suspicious cases of bovine tuberculosis and glanders or farcy; these, together with the swine and dog calls, easily swell the total number to more than 1,000 cases investigated and examined.

HOG CHOLERA.

Among the suspected diseases reported to this department has been cholera in swine. Nearly all reports have been received in cold weather. In some cases an examination of the sick animals which were reported as being affected with a contagious disease revealed an acute febrile trouble as pleurisy or pneumonia due to exposure to cold and wet in poorly constructed pens or running out in the open without shelter. Many suspected cases were found to be diseases of the digestive system due to errors in feeding filthy swill undergoing bacterial changes in dirty barrels or poisonous substances like strong alkalies, soap and various other poisons which are frequently found in refuse and garbage coming from hotels, restaurants and boarding houses and which is usually fed to swine without cooking. These troubles, which run a definite course lasting only a few days, are not produced by germs and are, therefore, not contagious. When pleurisy or pneumonia affects the herd, there are usually several animals sick with the same symptoms, such as coughing, short and quick breathing. Autopsy of dead animals reveals a generalized inflammation of the lungs and their covering.

In ptomaine poisoning, or in poisoning from chemical substances, there are usually similar symptoms exhibited by all the hogs that were fed the contaminated swill. There are usually signs of indigestion and pain. The affected animals are uneasy, refuse to eat and will often vomit. There may be constipation or diarrhoea, and the abdomen may be distended with gas. Occasionally there are convulsions, followed by paralysis. Post mortem appearances are inflammation of the mucous membrane of the stomach and some parts of the intestines. The liver is congested and the lymphatic glands of the digestive organs are occasionally swollen and inflamed.

Unlike these diseases cholera is caused by a specific germ or virus and is highly contagious. Some of the symptoms of hog cholera and swine plague, a very similar disease, are: hair, harsh and dry; eyes, watery, a gluey substance around the lids; locomotion becomes weak and irregular with imperfect control of the hind legs; the skin around the flanks, fore legs and abdomen may become purple; the skin of the ears frequently becomes much inflamed and, if the hog lives for several days, may assume a scabby appearance. The sick hogs separate themselves from the rest of the herd, are disposed to hide in the litter, and refuse to move when disturbed. There is usually a loss of appetite, though in some very acute cases the appetite may remain good until near death; chronic cases lose flesh rapidly and sometimes show extreme disturbance of the nervous system exhibited by partial or complete paralysis of the hind parts or by extreme nervousness. The cough is usually short and hacking. Occasionally constipation appears among the earliest symptoms, followed by diarrhoea. In some of the acute cases which appear at the beginning of an outbreak, the animals die suddenly. Later in the course of the disease as it appears in a herd, the cases assume a more chronic type.

The autopsy of an animal which has died of cholera usually shows blood-stained spots in the fatty tissue under the skin, and on the internal organs. The lungs may show evidence of pneumonia. The lymphatic glands in the mesentery and intestines appear deeply congested and inflamed. When the large intestine is slit open, dark spots, more or less blood-stained, are to be seen upon the lining membrane when the disease has been of the acute type. The chronic cases show peculiar and very characteristic ulcers in the lining membrane of the large intestine and they are usually more numerous near the caecum or blind pouch. These ulcers are irregular in outline, with yellowish or dark centers and frequently appear as being raised above the surface. The spleen is frequently enlarged and darker in color than natural. Small bright red spots are found on the surface or through the deeper structure of the kidneys. In some cases the lung lesions are most prominent, showing scattered and sharply defined areas which are dark red in color and solid like liver. The lining membrane of the chest may be diseased and the lung adhered to the ribs. In such cases, considerable straw-colored fluid is found in the chest.

In all cases investigated, a careful history of the disease was obtained and autopies were performed on animals which had recently died and some of the near dead were killed and autopsies made to aid in arriving at an accurate diagnosis. In all cases investigated, owners were fully informed as to the highly contagious and dangerous nature of the disease and recommendations and specific instructions were given how to care for the hogs, and prevent them from becoming infected by isolation of the diseased animals and thorough disinfection of the premises, and were advised as to the necessary precautions to be observed to prevent the spread of the disease from one herd to another on the same farm and to their neighbor's herds; they were also informed that there is no provision made by the statutes of Connecticut for the care and medical treatment of sick or diseased animals, but they were advised that a form of vaccination to prevent and cure the disease is now being used in the experimental department of the Federal Bureau of Animal Industry and in many of the experiment stations of the western states where hog raising is carried on extensively, and that many veterinarians have reported favorable results from its use when administered with care and under proper conditions at the beginning or in the very early stages of the disease. The owners were also informed where the serum could be procured if they desired to give it a trial, and that its administration and other treatment must be at their expense.

In most of the outbreaks investigated, the disease was in an acute form and nearly all the hogs on the farm were dead or the disease so far advanced that treatment could not effect a cure.

Recommendations—

When an owner or care-taker notices that one or more hogs in the herd exhibits any of the symptoms of hog cholera and in a day or two discovers more of them showing similar symptoms, he should at once separate the suspicious from the healthy animals and thoroughly clean and disinfect the pens. A qualified veterinarian should be called in to examine the cases as early as possible so that a diagnosis can be made and the healthy hogs vaccinated, if found desirable, in season to prevent the disease from developing and to stop the spreading of the infection. Extreme sanitary measures should at once be adopted, such as removing all suspected cases from the pens. The bedding, feeding utensils, etc., should be kept entirely separate, as the virus may be carried from the diseased animals on anything with which it may come in contact. It is frequently carried on the clothing and boots of persons who go around the infected pens. Special attention should be given to frequent cleansing and disinfection of the premises and everything used around the hogs. The litter should be burned with the decayed, broken wood-work, the pens scraped clean and sprayed freely with solution of liquor cresolis compositus, or carbolic acid, one quart to five gallons of hot water.

Hogs that have died of cholera should never be left on top of the ground as dogs, birds and wild animals are liable to feed on the carcasses and carry the disease to other localities. The carcasses should be buried together with everything that the sick animals have come in contact with while sick, provided it is of little value; if not buried, it should be thoroughly disinfected. When the dead hogs are buried, they should be covered with quick lime before the earth is thrown on and covered deep enough to prevent dogs and other animals from digging down to the carcasses and lime should be freely sprinkled over the ground around the place of burial. Dead animals should not be buried near springs or running water, as the water might become contaminated and spread the disease. Also, dogs and other animals should be kept away from infected pens.

On account of the filthy conditions under which hogs are usually kept, it is very difficult to clean and disinfect pens and surrounding premises where cholera has existed so that it will be entirely safe to use the same quarters again for hogs. If the pens are of little value, it will be more profitable and safer to tear them down and build new, selecting if possible another place on the farm to locate the new buildings. If the same buildings are to be again used for hog pens, they should be thoroughly cleaned and disinfected and allowed to remain unoccupied by swine for a period of three to six months after the outbreak. If diseased hogs occupy open lots, the ground should be ploughed and a year or more should elapse before it is again used for hog pasture.

GLANDERS AND FARCY.

Glanders may be defined as a well-marked malignant disease of a highly contagious character, its immediate cause being the introduction of a specific germ (Bacillus Mallei) into the animal's system, and having for its anatomical characteristic sores or ulcers of the mucous membrane lining of the nose, while the whole of the respiratory system is more or less affected, together with the lympathic or absorbent system, according to the stage of development and course of the disease.

Farcy is essentially the same disease as glanders but manifested in a different manner; it is, however, capable of producing glanders in the same way that glanders is capable of producing farcy; both diseases are caused by the same germ and can be contracted in the same manner. The term farcy is generally used when the disease manifests itself in the skin and along the course of the lymphatic vessels and denotes glanders of the skin.

Glanders is a very serious and loathsome, as well as invariably fatal disease which may attack horses, mules, donkeys, dogs, cats, rabbits, mice, guinea pigs and the human family. The disease runs a variable course according to the activity of the virus and the condition of the different individual animals.

In acute glanders the contagion is found in its most virulent form, as is shown by the infection of susceptible animals that come in the immediate neighborhood of glandered horses. drink from the same pail or trough, stand in adjoining stalls, work on the same wagon, or are fed from feed boxes or mangers which have become contaminated by the saliva and soiled by the discharge of animals affected with this disease. Horses that have been well cared for in good ventilated and well-lighted stables, and their physical condition has not become weakened by over-work, exposure or lack of proper food, may be affected with chronic glanders in the latent form and when moved from one part of the stable to another, or when worked hitched with one horse and then another, may be active agents in speading the disease without the cause being recognized. It frequently exists in the most insidious forms without being apparent. Glanders and farcy are transmitted by direct contact of the discharges of a diseased animal with the tissue of a sound one either on the exterior or when swallowed mixed with food, in the digestive system, or dried and inhaled like dust. Stable attendants serve as one of the most common carriers of the germ by conveying dried or fresh discharges from infected animals in cleaning, harnessing, feeding, and by means of the hands, clothing, and teeth of the currycomb, the sponge, the bridle, or the halter. Other means of contagion, possibly the most common and least considered by horseowners and drivers, is the public watering trough, hitching posts and, in many cases, stables where old, poor and low-priced horses are sold or exchanged that come from infected districts and scatter the disease in other localities where taken by the owner, who knew very little, and cares less, as to the seriousness of the malady.

SYMPTOMS.

The various forms of glanders and farcy differ mainly in severity of symptoms and course of development. For practical purposes they may be divided into clinical or physical symptoms and those that are hidden or obscure. Some of the more prominent symptoms are: discharge of a dirty mucous from one or both nostrils which changes in form or color according to the development of the disease. At the beginning it is thin, dirty white or transparent, becoming gray or greenish yellow with a tendency to adhere around the nostrils. When the blood vessels are involved the discharge is stained with blood. Small elevations and ulcers may be seen inside the nose, particularly on the nasal septum. The ulcers increase in size and run together having irregular, elevated borders where they have healed and a characteristic irregular star-shaped scar is left. The mucous membrane lining the nose, is usually inflamed, swollen and dark red with a blueish cast. There may be no odor from the nose in some cases, while others may be very offensive, especially if the nasal bones are affected. Certain glands between the branches of the lower jaw near the angle are often enlarged, hardened and nodular. In some cases swellings will be noticed on the head, body or legs. Farcy or glanders of the skin, shows small elevations on the skin that ulcerate and discharge a thin, sticky yellowish matter that becomes thicker and more like pus. The ulcers extend along the line of the absorbent vessels which become enlarged and corded; they run together, forming large, filthy-looking sores that are difficult to heal; these are liable to appear on any part of the legs, body or head. Some horses will be very lame and stiff-gaited. In many cases the animal grows poor and weak and the hair stands on end and looks rough, but a great many horses will eat well, keep in good flesh and be lively, at the same time badly glandered and extremely dangerous to other animals and human beings that come in contact with them.

In June, 1912, the Commissioner, with the approval of the Governor, issued the following:

Rules and regulations relative to the examination, quarantine and disposal of animals affected, or suspected by the commissioner, or those acting for him, to be affected with glanders or farcy, or which have been exposed to infection by such disease; and for the inspection, quarantine and disinfection of premises where such animals have been stabled, or of any premises which have been exposed to such infection.

EXAMINATION.

1. Every suspected case of glanders or farcy reported to the Commissioner will be examined at once by the Deputy Commissioner, or a local competent veterinarian designated by the Commissioner, at the expense of the State. When any animal so examined is found by the inspector to exhibit physical symptoms of glanders or farcy, and the owner concurs in that opinion, it shall be forthwith destroyed, and the carcass dis-disposed of agreeably to Rule 2 at the expense of the owner or keeper thereof, and without any compensation to said owner, but if the owner does not concur in such opinion of the inspector, and the Commissioner does so concur, proceedings shall be had, under Section 5 of Chapter 257 of the Public Acts of 1905.

DESTRUCTION.

2. All animals affected with glanders or farcy shall be immediately either killed and buried, or put in charge of a recognized or licensed undertaker, or rendering plant. If buried, the carcass must be covered with quick lime, and no part of it left within two feet of the surface of the ground. Hides may not be removed from glandered animals, except at rendering plants where hides are thoroughly disinfected.

DISINFECTION.

3. In every case where the Commissioner or an inspector under him shall be of the opinion that any premises have been exposed to infection by glanders or farcy, such premises, and the premises which have been occupied by any animal so affected, shall be at once disinfected.

Disinfection must be scrupulously carried out at once, according to the following directions: Carefully and thoroughly clean and scrape all surfaces to be disinfected and remove and burn all the dirt and filth, otherwise the filth that has adhered to them will eventually fall off and thus expose the germs it had originally protected from the disinfection. If the manger or other woodwork of the stall is old, decayed, porous or absorbent, it should be removed, burned and replaced with new material.

As to disinfectants either of the following formulae may be used: Liquor Cresolis Compositus (U. S. P.)

or

Carbolic Acid, one quart to five gallons of water, proportion about one to twenty,

or

Bichloride of Mercury (Corrosive Sublimate) 1 oz. to 8 gallons of water, proportion one to eight hundred.

The disinfectant should be applied with a spray pump, such as is used by orchardists, since by this method every part of the surface—whether smooth or rough and even the cracks—will be much more sure of being covered by the disinfectant than if applied in any other way. It is recommended that, after this has dried, the stalls, walls and ceilings be sprayed with whitewash, to each gallon of which four ounces of chloride of lime has been added. Old halters, harnesses, blankets and brushes and other stable utensils that are of little value should be either buried with the diseased animal, or destroyed by fire; all that is not thus disposed of should be thoroughly washed and disinfected. Blankets, cloth and wooden utensils should be boiled, or soaked in a solution of carbolic acid of the strength above mentioned, then rinsed in clean water and dried in the sunlight. Leather articles that cannot be boiled, should be washed in strong soap and water and then washed with disinfectant solution. The neck-yoke, wagon-pole, shafts, etc., which may have come in contact with a diseased animal, should receive the same care, also hitching posts and sheds where the horse has been recently hitched.

No animal shall be allowed to occupy any stall from which an animal affected with glanders of farcy has been removed until such stall has been cleaned and disinfected agreeably to this rule.

QUARANTINE.

4. When the official inspector shall suspect any animal to be infected with glanders, he may issue to the owner or person in charge thereof an order to quarantine such animal until such time as the Commissioner shall be satisfied that the disease exists or does not exist, but such quarantine, at the discretion of the Commissioner, need not prohibit the use of said animal under such restrictions as may be laid down in the order of quarantine.

A positive report from the U. S. Bureau of Animal Industry, or from the State Bacteriological Laboratory on a complement-fixation test of blood taken from any horse will warrant the Commissioner in suspecting that such animal is affected with glanders.

5. Attention is called to the following provisions found in Chapter 257, Public Acts of 1905:

Any person having knowledge of the existence of glanders or farcy who fails to give such immediate notice to the Commissioner shall be fined not more than fifty dollars. Any person who violates any provision of this section or any order of said Commissioner authorized hereby, or who interferes with or obstructs the Commissioner or any assistant employed by him in the discharge of his duties as herein provided, shall be fined not more than one hundred dollars, or imprisoned not more than thirty days, or both.

The Commissioner being empowered to employ assistants to enforce the provisions of this act, such assistants shall have the same powers as the Commissioner while so employed.

HEMAN O. AVERILL,
Commissioner on Domestic Animals.

Approved, June 11, 1912.

SIMEON E. BALDWIN,
Governor.

The scarcity of medium-priced horses and the constantly increasing value of all classes of horses, creates an incentive for unscrupulous dealers to sell or trade horses that show the first signs of glanders, instead of reporting their suspicions to the proper officials and having the animals examined as the law requires. The fact that owners of such suspicious animals know that there is no compensation allowed for glandered animals when condemned and that there is considerable expense and work required to clean and disinfect the stable which the condemned animals have occupied, to the satisfaction of the commissioner, has no doubt induced many to dispose of them to such as do not know or care little about the nature and seriousness of the disease. This method of trading aids very much in the spreading of the disease from one locality to another and is one of the most difficult practices to stop, as it is generally impossible to secure proof that the trader knew or had reason to suspect the existence of glandes or farcy when he disposed of a glandered animal.

Many of the cases condemned the past two years have been poor, old, worn-out, and nearly worthless horses that had been recently brought into Connecticut from large cities in adjoining states where glanders and farcy have existed for years.

Another factor in the control of glanders which is sometimes abused and aids in distributing the disease, is the modern scientific tests which may be used to detect the disease before it shows any clinical symptoms. Horses that have been exposed to infection may respond to one of these tests and yet show no physical evidence of glanders or farcy, and may be sold by unscruplous owners and at some later period the disease develops, gradually scattering the germs of the disease until open symptoms can be noticed. This method of disposing of diseased animals is carried on under cover, and evidence on which to prosecute the persons doing it is extremely difficult to obtain.

Tests for Glanders—

Methods of diagnosing glanders are the clinical or physical symptoms which the animal presents and scientific tests which are mallein and blood serum tests.

The mallein test is made by taking the horse's temperature at intervals of three to four hours during the day to get the average normal temperature. At night about 2 cc. of mallein is injected hypodermically in the animal's neck with aseptic precautions. Commencing eight hours after the injection the horse's temperature is again taken every two hours until eighteen or twenty hours have elapsed from the time of injecting the mallein. A rise of two degrees in temperature above the normal of the previous day, with a large, painful swelling at the point of injection and a general dejected appearance of the animal is considered a reaction and a strong indication that glanders is present.

The blood tests are made by drawing a small quantity of blood from a suspected animal and sending it to a bacteriological laboratory where the test is made. Since the laboratories of the U. S. Bureau of Animal Industry at Washington, D. C., and the State Board of Health at Middletown have been making these tests, which are known as the agglutination test and the complement-fixation test, there have been sent to these laboratories a large number of specimens of blood by veterinarians from all parts of the State by direction of this department and in some special cases, the mallein test has been applied by the veterinarian having charge of the case in addition to the laboratory test to assist in arriving at an accurate diagnosis. The mallein test is made at the owner's expense. The laboratory test is made free of charge to the veterinarian and to this department.

A more general observance of the law, which makes it the duty of health officers, veterinarians, animal undertakers and others, to report suspected cases of glanders and farcy, and the laboratory tests which have been so generally used, have brought to light many obscure cases of the disease and have increased the work of this department and resulted in a corresponding increase in the number of glandered horses, either condemned by the order of the commissioner, or reported to this office as having been destroyed by veterinarians in their private practice.

The number of animals affected with glanders or farcy that have been destroyed in this state during each of the six fiscal years that the present law has been in force as shown by the record of this office are as follows:

	1907	1908	1909	1910	1911	1912
Condemned each year by order of the commissioner:	28	18	28	53	67	99
Reported as destroyed by veterinarians in their practice:	53	59	49	133	186	170
Totals	81	77	77	186	253	269

The commissioner does not feel warranted in arbitrarily condemning every horse that a positive report from the bacteriological laboratory indicates to be affected with glanders or farcy for the following reasons:

1st. In a large percentage of such cases, the animals show absolutely no clinical symptoms of the disease, and the owners are unwilling to give their consent to the destruction of the suspect.

2nd. The reliability of the complement-fixation test has not yet been sufficiently demonstrated so that the inspector would have assurance that a post mortem examination of a reactor would positively reveal to the satisfaction of arbitrators that the animal was diseased with glanders or farcy.

3rd. A reactor might have contracted the disease so recently that the disease had not had time to sufficiently develop so that post mortem lesions could be discovered by even the practised eye of the expert veterinarian.

4th. The arbitration of such cases (see Sec. 5, Chapter 257, P. A. 1905) with negative results would be an expensive proposition for the state, and unsatisfactory to the owner and would soon bring the law and the scientific tests into undeserved ill repute.

5th. Such an arbitrary measure is not necessary as the public weal can be safeguarded by a quarantine of the suspect (see Sec. 4 of same chapter) till such time as the commissioner shall be satisfied that the disease exists or does not exist. The quarantine of a horse is not necessarily a great hardship on its owner, as the law gives the commissioner discretionary powers to permit the use of the horse under certain restrictions laid down by the commissioner in the quarantine order.

IMPORTATION OF CATTLE.

The General Assembly of 1911 passed a law, Chapter 156, Public Acts of 1911, forbidding the bringing of neat cattle more than six months of age into this state except they are accompanied by either a certificate of health signed by the official having jurisdiction of the diseases of domestic animals in the state from which they are shipped or a permit issued by the commissioner on domestic animals of this state. Prior to November 1st, 1911, when this new law went into effect, the commissioner published rules and regulations interpreting and explaining the same as follows:—

Rules and Regulations for the Importation of Cattle Into Connecticut, in Effect On and After Nov. 1, 1911.

1. All neat cattle, over six months of age, brought into this state, must be reported by the owner or his agent, in writing to the commissioner on domestic animals, State Capitol, Hartford, Conn., within twenty-four hours after their arrival at destination and held in quarantine till, in case they are brought in by a person having a certificate of their healthy condition from the authority having jurisdiction of the diseases of domestic animals in the state from which the cattle are brought, identified and released, or, if not so brought in, until they have been examined by the commissioner or his agent.
2. All neat cattle, over six months of age, brought into this state must be accompanied by a certificate of good health, signed or approved by the authority having jurisdiction of the diseases of domestic animals in the state from which such cattle are brought, or a permit from the commissioner on domestic animals and such certificate or permit, when cattle are shipped, should be attached to the bill of lading of the transportation company.
3. A tuberculin test chart, properly filled out and certified to by a veterinarian in any other state and approved by the authority having jurisdiction of the diseases of domestic animals in that state, will be recognized and accepted as a certificate of health in the meaning of the statute.
4. When neat cattle are brought into this state under certificate of health, as described above, the certificate must contain either a description of each animal including age, breed, sex and color or ear tag numbers, so that the cattle can be easily identified by the commissioner or his agent after their arrival in this state.
5. All neat cattle brought into this state accompanied by a permit from the commissioner on domestic animals must be held in quarantine at the place designated in the permit until

they have been examined and released by the commissioner or his agent. Such cattle, if intended for dairy or breeding purposes, will be given a physical examination and the tubeculin test by a veterinarian authorized by the commissioner, at the expense and risk of the owner. Cattle found upon such examination to be diseased will be condemned and destroyed without remuneration to the owner or slaughtered under proper inspection. Any tuberculin test of such cattle while in quarantine, made by any veterinarian or any other person not authorized by the commissioner to make such test, will be interpreted as "plugging" in the meaning of Sec. 6, Chapter 156, Public Acts of 1911.

6. Permits will be given to bring neat cattle into this state for exhibition at agricultural fairs when such cattle are to be taken out of the state immediately after the exhibition, unless the commissioner has reason to believe said cattle are affected with a contagious disease or are in an unhealthy condition.

7. Persons desiring to pasture neat cattle out of the state may furnish the commissioner with a list and description of such cattle including ear tag numbers to be kept on file for the purpose of identification, which will allow them to be returned within six months upon notification to the commissioner when they are returned.

8. Permits will be given to bring neat cattle into the state for a specified time and place for pasture, provided such cattle are marked with tags furnished by the commissioner.
At the expiration of the permit the cattle must be taken out of the state or tested with tuberculin,

9. Sec. 6, Public Acts, 1911, provides the following penalty:

> Any person who shall intentionally hinder the commissioner on domestic animals, or his agent, in the performance of any examination provided for by this act, or who shall attempt to defeat the objects of the tuberculin test applied to cattle by a previous injection of tuberculin known as "plugging," or shall in any way attempt to prevent an accurate result of such test, shall be fined not more than one hundred dollars, or imprisoned not more than thirty days.

10. All requests for permits or for further information should be addressed to Commissioner on Domestic Animals, Hartford, Conn.

H. O. AVERILL,
Commisioner on Domestic Animals.

The commissioner, under the discretionary power given him by Section 2, has made a rule that all cattle brought into the state under a permit for dairy or breeding purposes must be examined by the tubeculin test, supplemented by a physical examintion, by a graduate veterinarian approved by the commissioner. Working oxen and steers for fattening purposes are released from quarantine if they pass a physical examination made by a inspector acceptable to the commissioner. Permits are given by this office for the admission of cattle into this state for immediate slaughter, subject to examination at time of slaughter by the local city meat inspector, if such there be, or by an inspector designated by the commissioner or approved by the local health officer. Cattle failing to pass such examination will be condemned and destroyed under the direction of the commissioner without remuneration to the owner. The inspectors who identify neat cattle accompanied by certificates of health or examine cattle brought in under permits, report to this office all cattle released from quarantine by them. The inspectors' fees for such identification or examination are paid by the owners.

CONTAGIOUS ABORTION.

Contagious abortion in dairy cows is seriously affecting the dairy and breeding industry in many parts of the state. This disease is caused by germs and may be transmitted directly at the time of breeding or through the medium of bedding or food which has been contaminated by coming in contact with diseased cows. The infection is frequently carried from one herd to another on the hands and clothing of herdsmen. When a herd becomes contaminated, it is very difficult to eradicate the disease and the loss from dead calves, unthrifty cows and curtailed milk supply, is usually enormous before the herd can be freed from the ravages of the disease. A serious percentage of cows that abort subsequently become sterile.

Preventative measures against the disease getting into the herd are of the utmost importance. Great caution should be exercised not to introduce the disease into a healthy herd by the purchase of any animal from a herd where the disease exists. Equal care should be taken by the farmer, when visiting suspected herds, to see that his clothing does not carry the infection to healthy herds.

Isolation of diseased cows, as soon as the trouble is suspected, and burning of all discharges from them, with thorough and painstaking disinfection of the cow and stable with carbolic acid, or liquor cresolis compositus (U. S. P.), one quart to five gallons of water, will do much to prevent the spread of the disease.

Treatment of the diseased cows has been of little satisfaction, further than what could be done through sanitation, until very recently, when an antitoxin or vaccine was manufactured from the germs which cause the disease, which is expected and promises not only to cure the disease but may be used to immunize the cow against contracting the disease. The deputy commissioner has secured a quantity of the vaccine from a well-known manufacturer of biological products free of expense and is carefully experimenting with it in the Connecticut Agricultural College herd at Storrs, where the disease has obtained a foothold. Four doses are given to each cow. The vaccine is administered hypodermically with aseptic precautions, at intervals of seven to ten days. The strength of the vaccine is increased with each successive dose. cows eight months or over in gestation are not treated, as a reaction may occur at this period and cause abortion.

Another means of assissting in eradicating the trouble is by diagnosing the disease before abortion takes place, which is being tried out in some of the experiment station laboratories. This is called the complement-fixation test and is made with blood serum taken from the cow suspected of being diseased. The principle is the same as that used in diagnosing certain diseases of the human and the test is now used at the laboratories of the State Board of Health to diagnose glanders. The test has to be carried out in a properly equipped bacteriological laboratory and by persons trained in that line of work. If this test for diagnosing contagius abortion and the vaccine method of preventing and curing the disease prove successful from a practical standpoint, the dairy interests will be greatly improved and the public benefited thereby.

RABIES.

During the past two years the commissioner has made rules and regulations concerning dogs as follows:—

Location.	Date.	Period.
East Lyme,	Jan. 25, 1911	3 months
Eagleville and Mansfield school districts,	Feb. 7, 1911	3 months
Old Lyme,	Feb. 14, 1911	3 months
Parts of Canton and Avon,	Mar. 4, 1911	3 months
Parts of Thompson and Putnam,	Mar. 14, 1911	3 months
Killingly,	Mar. 31, 1911	3 months
Lebanon and Franklin,	April 6, 1911	3 months
Greenwich.	Feb. 21, 1912	3 months
Putnam,	Mar. 27, 1912	3 months
Norwalk,	Apr. 2, 1912	3 months
New Canaan,	May 10, 1912	3 months
Stamford,	June 11, 1912	6 weeks
Greenwich,	July 2, 1912	2 months
Danbury,	Aug. 6, 1912	3 months
Redding and Ridgefield,	Sept. 18, 1912	3 months
Westport and Wilton,	Sept. 23, 1912	3 months

With slight variations the several orders were as follows:

Rules Concerning Dogs in the Town of ————.

WHEREAS, A rabid dog has been at large in the town of ————, biting and coming into contact with certain known dogs, and exposing other and unknown dogs to the contagious disease known as rabies,

NOW, THEREFORE, In order to prevent the spread of the dangerous and contagious disease known as rabies and to protect the public therefrom, the undersigned, Commissioner on Domstic Animals, by virtue of the authority given in Chapter 170 of the Public Acts of 1907 and Chapter 55 of the Public Acts of 1909, hereby makes and promulgates the following rules and regulations for the confinement and control of dogs, to wit:

1. All dogs in the said town of ————, that are known to have been bitten by or to have come in contact with any rabid dog, shall be forthwith mercifully killed by the Dog Warden of said town.

2. No dog shall be allowed to go at large in said town of ———— for a period of three months from and after the day these rules shall go into effect, except it wear a muzzle of such construction as to absolutely prevent the dog's biting.

3. The dog warden of the town of ———— shall capture and take into his custody every dog in said town not confined or controlled agreeable to the foregoing and shall impound, hold and kill such dog as is provided by Section four (4) of said Chapter 55 of the Public Acts of 1909.

4. These rules shall take effect ———— o'clock in the ———noon, ————, ————, 1912.

PENALTY.

Section 4 of Chapter 170 of the Public Act of 1907, provides the following penalty for non-compliance with the foregoing rules: "Every person who shall violate or neglect or refuse to comply with any rule or regulation made under the provision of Section one of this act shall be fined not more than seven dollars ($7.00.)"

Dated at Hartford, Connecticut, this—— day of —— 191—.

————————

Commissioner.

These rules are legally promulgated by the commissioner by mailing a copy to the local town clerk and by advertising in a local newspaper at least five days before they go into effect. This delay is necessary to thoroughly advertise the rules and to give dog owners opportunity to secure muzzles for their dogs. Usually about ten days elapse after a rabid dog has been killed before a muzzling order takes effect but this delay need cause no fear of a spread of the infection for the following reasons:

First. Because every dog that is known to have come into contact with a rabid dog may be "justly suspected of being rabid" and may be killed on sight by the local selectmen or dog warden. Sec. 6, Chap. 55, P. A. 1909.

Second. Because twenty days is the minimum period of incubation of the germ of rabies and consequently the earliest possible time that any secondary case could develop.

There is no disease that is regarded by the public with greater dread and horror than rabies and it may be very easily communicated from one dog to another dog or to any domestic animals or to the human by even a slight scratch of the canine's tooth. It is also true that there is no disease which may be so easily controlled and eradicated. It is not too much to say if every dog in any town or in the state that has been exposed to the disease should be killed at once or should be closely confined or even securely muzzled for a period of six months, that the disease would be completely stamped out of that territory. In view of this fact, the commissioner has recognized it to be his duty, whenever he has had knowledge that a rabid dog has been at large in any town and has had opportunity to bite unknown dogs, to immediately promulgate rules to protect the public and to ues his best endeavors to see that the rules are strictly enforced.

The following circular letter explains itself:—

State of Connecticut.
Office of
COMMISSIONER ON DOMESTIC ANIMALS.
State Capitol, Hartford.

Oct. 28, 1912.

To Selectmen and Dog Wardens in the several towns in which Rules Concerning Dogs recently made by the Commissioner on Domestic Animals are in force:

Dear Sirs:—

Complaints have been made to me that my rules forbidding any dog to be allowed to go at large in your towns except it wear a muzzle of such construction as to absolutely prevent its biting, is not being strictly enforced by you.

I desire to call your attention to the fact that I made this rule because I considered it necessary to do so to protect personal property and human life. A rabid dog has been at large in your town and has had the opportunity and the mania to bite other dogs. Every dog thus bitten is liable to develop the disease, and if at liberty will almost surely start out on a wild chase through your town and very likely through other towns biting every dog, domestic animal and human being that crosses his path in his mad career.

Rabies is an awful disease and the terrible suffering and agony of one human being, yes, even of one dog, or of one horse, or one cow, slowly but surely dying of the malady, is inconceivably greater than the combined unpleasantness and inconvenience caused all the dogs in your several towns by wearing muzzles for a period of three months.

No person considers it cruelty to compel a horse to wear a bridle and some will even yank the bit in the horse's mouth because he does not want to stand still long enough to let the driver express his views about the cruelty of compelling dogs to wear muzzles for the short period required by my rules.

It should be borne in mind that dogs do not have any inherent right to run at large in a civilized community at any time and that it is no abridgement of their rights to keep them in close confinement for such length of time as is thought best for the public good. It is a concession to the dog to permit him to be at large with a muzzle in a community like yours where a rabid dog has been at large unmuzzled.

If you will very carefully read Sec. 6, Chapter 55, P. A. 1909, (Sec. 12 of enclosed compilation) you will see that the Commissioner on Domestic Animals is given arbitrary power to make at any time, rules for controlling or destroying dogs in any town, as he may deem reasonable for the security of the inhabitants or their property, and selectmen and dog wardens are given plenary authority to kill, on sight, all dogs not controlled in accordance with such rules, or which shall be found rabid, or justly suspected of being rabid, or are found doing mischief if unattended by a caretaker, or are found killing or worrying domestic animals, etc. — — and to receive $3.00 for every dog so killed. Sec. 14, Chap. 167, P. A. 1907 provides a penalty of fine or imprisonment, or both, for every person violating any rule legally made, and makes it the duty of dog wardens and prosecuting officers to diligently inquire after and prosecute any violation thereof. This section also says the Commissioner on Domestic Animals "shall, upon the complaint of any person that any such officer is dilatory or negligent .... make such orders and take such action as he shall deem necessary to secure such enforcement."

I feel that I would be derelict to my trust if I neglected to promulgate rules sufficiently rigid to protect human life and personal property from rabid dogs and, having made the rules, to use my best endeavors to secure their strict enforcement.

Webster defines "muzzle" as "A fastening for the mouth which stops biting." A dog wearing a leather head-stall of such construction or so adjusted as to permit the dog's biting, or even scratching with its teeth, is not muzzled agreeable to the requirement laid down in No. 2 of the rules made and promulgated by me, because the infection of rabies may be as readily communicated by even a slight scratch of an affected dog's tooth as by a deep bite.

I would recommend the dog warden to capture and hold every dog found at large in his jurisdiction that is not securely muzzled and if unable to catch such dog, and if the owner or keeper of the dog is unknown to the dog warden, I would say that he may, at his discretion, kill such dog.

I sincerely hope you will heartily co-operate with me in the efforts I am making to stamp out this terrible disease in this state, and if your efforts to enforce my rules are criticised by dog owners, you are hereby given full permission to lay the entire responsibility of your actions as above advised on

Yours truly,
HEMAN O. AVERILL,
Commissioner on Domestic Animals.

DOG TAGS.

	1911	1912
Dog License Tags ordered by Town Clerks,	74,650	73,775
Kennel License Tags ordered by Town Clerks,	646	711
Total number Tags ordered by Town Clerks,	75,296	74,486
Number of Kennel licenses,	57	55
Paid for Tags,	$764.97	$743.28
Paid for advertising Rules de Dogs,	101.49	103.17
Paid for Sundry Expenses,	117.77	33.25
Paid State Treasurer,	2,896.32	2,825.90
Received for Tags,	3,880.55	3,705.60
Due for Tags, Oct. 1st, 1912,	273.10	361.15
One town, credit balance,		4.25
Net balance due,		$356.90

The following circular letter has been sent to veterinarians and others who have been deputized by the commissioner to investigate suspected cases of bovine tuberculosis:

State of Connecticut.

Office of

COMMISSIONER ON DOMESTIC ANIMALS.

State Capitol, Hartford.

Dear Sir:—

My experience and observation during the twelve years I have been commissioner convince me that bovine tuberculosis is a stable disease, and that it is very rarely if ever communicated from one animal to another while cows are in the pasture and I feel safe in asserting that this terrible scourge will never be permanently eradicated from the herds in this state until more sanitary conditions are introduced into a majority of the stables where the dairy cow is housed.

I consider it as truly to be my duty to carry on a campaign of instruction as to wage a war of destruction and in order to do this and in order that the work of this department may be thorough and uniform in all sections of the state, I would respectfully call your attention to the following suggestions and recommendations.

More than one-half the life of every well-kept dairy cow is spent in the stable, it is therefore essential to her health and productiveness that she be well housed.

Notice carefully the stables where the cows are kept and see if they are light, dry, clean and well ventilated, and the walls and ceilings freshly whitewashed. If you find them in good sanitary condition, speak a word of appreciation to the owner. If you find the stables are dark, damp, filthy and ill-ventilated, kindly call the owner's attention to the fact and suggest to him how they could be improved by putting in more windows to admit the sunlight and by whitewashing the walls and ceilings to reflect the light. If you find an animal suffering with tuberculosis, look over the whole herd, but especially the two standing next to the affected animal. Explain to the owner the necessity of thoroughly cleansing and disinfecting the stall and manger where a diseased animal has stood before another animal is allowed to occupy them, and advise him how to do it.

A tuberculous animal in a herd of cows is a source of danger to its herd-mates and a curse to its owner and should be removed at once to protect the health of the other animals and also of the owner and of his family and of the public who consume the milk from the herd.

The state pays for tuberculous animals for reasons just given and for the further reason that if allowed to be sold or traded they would carry the disease to other stables and infect the other herds. No better argument can be presented to show that the state should pay for animals that have died or been killed, than that it should pay for potatoes that have been frozen or for apples that have rotted.

In considering the matter of appraisal of tuberculous animals you should impress upon the mind of the owner the fact that such animals have absolutely no intrinsic value except their hides, which the owner is permitted to remove and sell; but as such animals have a certain trading or perhaps producing value, the owner should be recompensed for them **NOT TO EXCEED** their apparent present worth **LESS** the value of their hides. It matters not what such animals were worth one, four, or six months previously, or what they would be worth at time of appraisal if they were all right, nor does it matter very much whether they are pure-bred cows or scrubs. It should be simply the question, how much would a good, bright, honest dealer give for those animals just as they stand when you see them, less the value of their hides.

Please be prompt, after making inspections for me, in filling out accurately and mailing to this office your reports on blanks furnished by me, "Form 5," giving receipted bill for services rendered, number examined, name and P. O. address of owner, town in which cattle are found, sanitary condition of stable, number condemned and total amount allowed.

In filling out the other blanks the owners' P. O. address should always appear at the bottom of "Form 3" and at the top of "Form 4" and the town in the body of "Form 3." The owner, or some competent person for him, should sign and make oath to the certificate of condemned animal's six months residence in this state, found on "Form 3," and should also receipt the bill for animal before it is returned to me for my approval.

Chapter 89, Public Acts of 1911, makes it necessary for the owner to file with the commissioner a sworn certificate that the animal has been killed and buried and the premises disinfected according to the order of the commissioner before the commissioner can approve the bill for the value of the condemned animal. On the reverse on "Form 3" will be found my order for disinfection, with full directions for same, also a blank certificate for the owner or his representative to sign and make oath to as required by law. If the animal condemned is in pasture and has not been stabled for a considerable period, you will please write and sign a statement to this effect directly under my "order," and erase the words "and the premises disinfected" in the certificate.

Please address all reports to Commissioner on Domestic Animals, Hartford, Conn.

I highly appreciate the promptness and the honest purposes that have characerized your work for me in the past, and I earnestly hope that you will co-operate with me in the future along the lines mentioned above.

Yours respectfully,
H. O. AVERILL,
Commissioner.

The following is a copy of "Form 3" referred to above, with directions and order for disinfection and blank certificate to be signed by owner as required by law on the reverse:

State of Connecticut

COMMISSIONER ON DOMESTIC ANIMALS.

Adjudged Values of Cattle to be killed.

Whereas, the Commissioner on Domestic Animals for the State of Connecticut has this day made or caused to be made a physical examination of certain cattle said to be owned by..............of the town of ...., and Whereas, it appears to said Commissioner that it would be for the good of the State that the following animals should be destroyed, to wit: ....Cows,....Heifers,....Oxen,....Steers, ...Bulls,....Calves. Total number,........

Now Therefore, we, the said Commissioner and the said owner, do hereby adjudge the value of said animals to be as follows: Cows, $.....; Heifers, $.....; Oxen, $.....; Steers, $.....; Calves, $.....; Bulls, $.....; Total $...... The said owner hereby agrees to bury said animal as soon as killed, and comply with all requirements of public Health Officer in said town, and the said Commissioner agrees to approve the above total value to the Comptroller when a sworn certificate shall have been filed with the Commissioner that the animals have been killed and buried and the premises disinfected according to the order of the Commissioner.

I hereby certify that the above described animals have been owned and kept in this State six months continuously prior to the time they were condemned.

................Owner.

Subscribed and sworn to before me this....day of.......
19 .

............Notary Public.
Justice of the Peace.

Dated at......this....day of....191

....................,
Commissioner on Domestic Animals.
..............Owner.

Signed in duplicate and left with the owner or his representative who should, as soon as the requirements have been complied with, sign and make oath to the certificate on the other side and return the same to the Commissioner on Domestic Animals, Hartford, Conn.

DIRECTIONS.

For the disinfection of stables after animals affected with a contagious or infectious disaese have been removed.

Success in disinfecting depends, very largely, upon the thoroughness with which the work of preparation is done, as the disinfectants do not destoy germs with which they do not actually come in contact. It is, therefore, highly important in order to do the work thoroughly, that all surfaces to be disinfected should be carefully scraped and cleaned out, and that all filth which has adhered to them be completely removed and burned. Otherwise the filth will eventually fall off and thus expose the germs which it had originally protected from the disinfectant.

As to disinfectants, the following formulae are recommended.

BiChloride of Mercury (Corosive Sublimate)
1 Oz. to 8 Gallons of water. Proportion one to eight hundred.
Or
Carbolic Acid, 1 Quart to 5 Gallons of water.
Proportion one to twenty.

These disinfectants should be applied with a spray pump since with this method every part of the surface—whether smooth or rough, and including cracks—will be much more sure of being covered by the spray than if applied in any other way.

It is recommended that after the stable has been thoroughly disinfected, it be sprayed with lime whitewash, to which has been added one pound of chloride of lime to three gallons of whitewash.

Every stable where dairy cows are kept should be whitewashed at least twice a year, as lime as well as being a good disinfectant will cover up the germs and is also a good reflector of light.

The matter of light stables is receiving a great deal more attention than in years past. It costs but little to put in windows or, with the aid of a spray pump, to apply whitewash. Light is a good germicide and in addition to this, it adds to the productiveness and comfort of the cows and also to the pleasure and satisfaction of the herdsman who cares for the animals.

It is hereby ordered that every stall and manger recently occupied by any animal condemned as affected with tuberculosis be disinfected before the owner can be paid the agreed value of the animal.

H. O. AVERILL,
Commissioner on Domestic Animals.

I hereby certify that the within described animals have been killed and buried and the premises disinfected according to the order of the Commissioner.

...............Owner.

Subscribed and sworn to before me this...... day of ...., 191 .

..............Notary Public.
Justice of the Peace.

A COMPILATION OF THE LAWS CONCERNING THE INSPECTION AND TRANSPORTATION OF CATTLE.

Corrected to the rising of General Assembly of 1911.

[Chapter 158, Public Acts 1909.]

The governor shall, on or before the 15th day of July, 1909, and quadrennially thereafter, appoint a commissioner on domestic animals, who shall be a practical farmer and stock breeder of at least ten years experience, who shall hold office for four years from the fifteenth day of July following his appointment, unless sooner removed by the governor, for cause; and the governor shall fill any vacancy occurring during such term for the unexpired portion thereof. Said commissioner may, with the approval of the governor, employ such assistance as may be necessary, and any expense so incurred shall be paid by the state upon the approval of the governor. Said commissioner shall biennially report to the governor concerning his acts and expenses.

[Chapter 254, Public Acts 1911.]

The commissioner on domestic animals may appoint and remove a deputy, who shall be a graduate of a veterinary college of recognized standing and of at least five years' experience in the practice of veterinary medicine and surgery. Said deputy shall, under the direction of the commissioner on domestic animals, have the powers of the commissioner.

GENERAL STATUTES.

Sec. 4374. Said commissioner may quarantine all animals infected with a contagious disease and prohibit the sale of all the products thereof; but no animal shall be quarantined that does not give evidence of disease upon competent physical examiation, and no animal shall be quarantined for more than thirty days.

[G. S. Sec. 4375 as amended by Chapter 89,
Public Acts 1911.]

If said commissioner finds that it will be for the benefit of the state, he may cause said animals so quarantined to be killed, but no animal so quarantined shall be killed until its value has been adjudged by the owner and the commissioner, and if they cannot agree each shall choose an arbitrator, who shall choose a third, and the three so chosen shall determine the value of the animal. The value thus determined shall, when approved by the commissioner and when a sworn certificate shall have been filed with the commissioner that the animal has been killed and buried and the premises disinfected according to the order of the commissioner, be paid to said owner, by the state, upon the order of the comptroller; but no animal the physical condition of which is such that it is of no real value, and no animal which has not been in this state during the six months next preceding its quarantine, shall be paid for by the state. This section shall not apply to horses.

Sec. 4376. The commissioner shall, at the request of the owner of any domestic animal in this state, inspect the same by physical examination, and if he find it free from disease dangerous to the public health he shall so certify to the owner.

Sec. 4377. The selectmen in each town shall report to the commissioner any animals infected with contagious disease.

Sec. 2591. Every person who shall knowingly sell, or expose for sale, milk, or any product of milk, from a cow which shall have been adjudged by the commissioner of domestic animals affected with tuberculosis or other blood disease shall be fined not more than seven dollars, or imprisoned not more than thirty days, or both.

[Chapter 108, Public Acts 1911.]

Upon written application by any owner of cattle in this state, the commissioner on domestic animals or his authorized agent may inspect such cattle, and after said commissioner shall have found, so far as can be determined by a physical examination and by tuberculin test, that such cattle are free from tuberculosis, he may issue to the owner of such cattle a certificate in writing describing such cattle and stating that, so far as can be determined, said cattle are free from tuberculosis. The cost of applying the tuberculin test as provided by this section shall be paid by the owner of the cattle so tested.

[Chapter 156, Public Acts 1911.]

Section 1. No person shall, except in accordance with the provisions of sections two and three of this act and under a permit as provided for therein, ship or cause to be shipped, or bring or cause to be brought into this state any neat cattle over six months of age, unless a certificate of the health of such cattle has been obtained from the authority having jurisdiction of the diseases of domestic animals in the state from which such cattle are brought or shipped, and the owner, or his agent, of any cattle so brought into this state shall, within twenty-four hours after the arrival of such cattle at their destination, give notice thereof in writing to the commissioner on domestic animals.

Sec. 2. The commissioner on domestic animals may, in his discretion, grant to any person making application therefor a permit in writing authorizing such person to ship or bring neat cattle into this state, without having obtained the certificate provided for in section one, conditioned that any such cattle shall be placed in quaratine at the place of their final destination or such other place as shall be designated by such commissioner. All cattle so placed in quarantine shall be examined by the commissioner or his agent, either by physical examination or by the tuberculin test, as said commissioner may determine, and shall not be released from such quarantine until the commissioner shall have ordered such release. The commissioner may cause any cattle found, upon such examination, to be diseased, to be killed as provided by section 4375 of the general statutes as amended. The cost of such testing or examination shall, before such cattle are released from quarantine, be paid by the owner of such cattle, but the cost of keeping such cattle in quarantine, for a period not exceeding six weeks, shall, subject to the approval of such expense by said commissioner, be paid by the state.

Sec. 3. The commissioner on domestic animals may, in his discretion, issue to any person a written permit authorizing such person to bring cattle into this state for the purpose of exhibiting the same at any agricultural fair or other public exhibition or to bring into the state cattle which such person has taken or intends to take out of the state for the purpose of such exhibition.

Sec. 4. No railroad, steamship, or other transportation company or carrier shall transport any neat cattle into this state unless the same be accompanied by a certificate of good health as provided by section one of this act, or by a permit as provided for in section two or section three hereof.

Sec. 5. Any person violating any of the foregoing provisions of this act or any officer or agent of any corporation directing or causing the violation by such corporation of any of said provisions shall be fined not more than fifty dollars for the first offense and not more than one hundred dollars for each subsequent offense.

Sec. 6. Any person who shall intentionally interfere with the performance of any examination provided for by this act, or who shall attempt to defeat the objects of the tuberculin test applied to cattle by a previous injection of tuberculin known as "plugging," or shall in any way attempt to prevent an accurate result of any such test, shall be fined not more than one hundred dollars, or imprisoned not more than thirty days.

State of Connecticut
PUBLIC DOCUMENT No. 29

BIENNIAL REPORT OF THE TRUSTEES

OF THE

CONNECTICUT AGRICULTURAL COLLEGE

AT

STORRS, CONN.

For the two fiscal years ended September 30, 1912, and for the two years in other matters ended November 30, 1912

PRINTED BY ORDER OF THE LEGISLATURE
PUBLICATION APPROVED BY THE BOARD OF CONTROL

HARTFORD
PUBLISHED BY THE STATE
1913

Resolution of the Board of Trustees upon the Death of Arthur J. Pierpont

"Arthur J. Pierpont, for nine years a member of this board, died on September 20, 1912.

"Mr. Pierpont was graduated at the Connecticut Agricultural College in the class of 1895, and at once entered on the business of farming, which he followed until the time of his tragic death. In the short period of fifteen years he brought his farm into satisfactory productiveness, built up one of the best dairy herds in the state, and paid off a debt of $8,000 due on the farm.

"For six years Mr. Pierpont has also been the efficient manager of the Gilbert Farm, at Georgetown, and for nine years has been a representative of the alumni on the board of trustees of this college.

"Endowed with a fine physique and high courage, and equipped with the education and faith in his calling which his college course gave him, he overcame difficulties which to many would have been discouraging, if not insuperable.

"Under hard conditions he demonstrated the possibility of profitable farming in Connecticut, but died too soon to receive in adequate measure the material returns from it.

"We, the trustees of the Connecticut Agricultural College, in this minute desire to express our appreciation, not only of the service which Mr. Pierpont rendered to the college as a trustee and as manager of the Gilbert Farm, but more especially of the greater service which he has rendered to the state at large, by his example of the successful application of education, courage, and skill to the problems of our Connecticut agriculture.

"With our appreciation of his services and our sense of public loss in his untimely death, we also desire to express our deep sympathy with his family."

The
Connecticut Agricultural College

BOARD OF TRUSTEES

The Governor of Connecticut .... Ex-officio
SIMEON E. BALDWIN, LL.D., New Haven

Director of the Connecticut Experiment Station .... Ex-officio
EDWARD H. JENKINS, Ph.D., New Haven

Appointed by the Senate	Term Expires
E. STEVENS HENRY, Rockville	1915
GEORGE A. HOPSON, Wallingford	1915
LEWELLYN J. STORRS, Mansfield Center	1915
CHARLES A. CAPEN, Willimantic	1913
CHARLES M. JARVIS, Berlin	1913
JOSEPH W. ALSOP, Avon	1913
Elected by the Alumni	
ARTHUR J. PIERPONT,* Waterbury	1915
HARRY G. MANCHESTER, Winsted	1913
Elected by the Board of Agriculture	
D. WALTER PATTEN, North Haven	1913

Officers of the Board

GOVERNOR SIMEON E. BALDWIN	President
HARRY G. MANCHESTER	Vice-President
CHARLES A. CAPEN	Secretary
E. O. SMITH	Treasurer

Executive Committee
G. A. HOPSON, J. W. ALSOP, H. G. MANCHESTER

Gilbert Farm Committee
J. W. ALSOP, A. J. PIERPONT,* H. G. MANCHESTER

Auditor of Accounts
L. J. STORRS

---

*Deceased.

To His Excellency, Simeon E. Baldwin, Governor of the State of
Connecticut:

I have the honor to submit herewith the report of the board of trustees of the Connecticut Agricultural College for the two fiscal years ended September 30, 1912, and for the two years in other matters ended November 30, 1912.

Very respectfully,

C. A. CAPEN,
Secretary of the Board of Trustees.

Report of the President

To the Trustees of the Connecticut Agricultural College:—

I have the honor to submit herewith a report for the two years ended November 30, 1912.

STUDENT ENROLMENT—The number of students enrolled in regular courses for the fall terms of 1907 and 1908 averaged 134, and for the corresponding periods of 1911 and 1912 averaged 210 students, a gain of 76, or 56%, in four years. During this period the two-year academic course has been discontinued and a two-year course School of Agriculture has been put in force. The college course in agriculture has been changed from one requiring two years of study to one requiring four years for completion. The enrolment will be further increased, therefore, by reason of the lengthening of the regular agricultural course, but the full effect on numbers will not be realized until the fall of 1914.

The short winter courses have been discontinued by reason of the lack of dormitory accommodations. The new dormitory, when completed, will relieve the congested condition in the present living quarters and provide for the increased enrolment due to the lengthening of the college course and the extended residence of those registering therein. There is little prospect, however, that dormitory accommodations will permit a resumption of the short winter courses, or that there can be received in the longer courses the larger number who, it is reasonable to think, may seek admission in the near future.

It will not be wise, I believe, to attract or receive additional students, nor will it be desirable to build additional dormitories, until the needed buildings and equipment are provided for adequate instruction to students now registered, and until the moneys for the maintenance of the institution as a whole are increased to an amount sufficient for the upkeep of the college at its present size.

PHYSICAL DEVELOPMENT OF THE COLLEGE—Mr. Charles N. Lowrie of New York, landscape architect, has been employed by the trustees, and a plan has been adopted for the laying out of the campus with respect to its future growth, taking into account the grouping of buildings and the laying out of walks and drives. Mr. Lowrie has been consulted in regard to the style of architecture of the buildings now under process of erection. A plan for the ornamental planting of the grounds has been prepared and accepted by the trustees.

ELECTRIC LIGHTING—The General Assembly of 1911 granted an appropriation of $8,000 for the electric lighting of the college buildings. Plans and specifications for wiring were prepared by Ford, Buck & Sheldon, and a contract for installation was made with E. S. Francis.

Electric current is obtained from the Willimantic Gas & Electric Light Co., with whom a contract has been made for a period of three years.

FURNISHING OF THE DINING HALL—The appropriation of $5,000 for furnishing the dining hall has been expended, and a modern equipment for cooking and serving has been installed in this building.

FACULTY COTTAGES—The appropriation for cottages has been used in part for the purchase of the Phelps and Gulley cottages, the Snow, Green, and Jacobson properties. The remainder of the appropriation is being used for the erection of two cottages located on Whitney drive. Plans for the two cottages were prepared by Unkelbach & Perry, architects, and the contract for the erection was awarded to Alexis Caisse for the sum of $7,938.

OTHER BUILDINGS—Plans and specifications for the dairy barn and the horse barn, for which an appropriation was made by the General Assembly in 1911, have been prepared by Edward Burnett; for the poultry school building, by Francis E. Waterman; for the addition to Agricultural Hall, by Unkelbach & Perry; for the new dormitory, by Davis & Brooks. A contract for the erection of the above buildings has been made with the Fenton Charnley Building Co. for the sum of $117,650.

EAGLEVILLE ROAD—The appropriation of the General Assemply of 1909 for the improvement of the highway from the college to Eagleville has been used under the direction of the state highway commissioner. The layout has been changed in several places from the course of the former highway, the town of Mansfield furnishing the funds for the purpose of securing the new right of way. One mile and a half or more of the roadway has been graded and improved. The state highway commissioner has certified to the state comptroller as to the above construction, as provided in the grant, and the board of trustees have approved of the drawing of the order upon the state treasurer for the amount of the contract. The expenditures have amounted to $9,129.31, leaving a balance of $870.69.

OTHER IMPROVEMENTS—During the two-year period current funds have been used for the erection of fifty colony hen houses; for the removal of the church parsonage and the horse barn from the front campus; for the remodeling of the Gulley house, and for the remodeling of the Jacobson cottage to accommodate two families; in the main building for the enlargement of quarters for the library, and providing a music room for the use of the glee club and other musical organizations, a lavoratory for women, a post office room with lock boxes for students, and a woodworking shop for the department of mechanic arts; for the construction of a quarter-mile track on the athletic field and the erection of bleachers; for a cement walk from the dining hall to the main building and to Storrs Hall; for providing two apartments in Whitney Hall; and for finishing the dining hall.

SCHOLASTIC DEVELOPMENT OF THE COLLEGE—In the fall of 1909 the college course in agriculture was changed from two years to three years of training for graduation with a diploma.

In 1911 an additional year of instruction in agriculture was added, making a course of four years required for graduation. Students entering with two years of high school preparation were to be graduated with a diploma, and those entering with four years of high school preparation were to be graduated with the degree of B. S.

The faculty have recommended a further change, and in the fall of 1914 admission to the college of agriculture will be restricted to high-school graduates.

The result of these changes will be an increase in admission requirements to the college course in 1914 of two years additional preparation over the requirements of 1908, and the establishment of a college of agriculture in fact as well as in name, requiring high school preparation for admission and leading to graduation with the degree of B. S. on the completion of four years of study. This course is designed for the training of young men for leadership in agriculture—as scientific farmers, teachers, investigators, and agricultural experts.

ACADEMIC COURSE—The academic course, heretofore given to accommodate those who were unable to meet our entrance requirements, was abandoned in 1911, the last class certificating in 1912. The instruction in this course duplicated that of local high schools, and it was deemed inadvisable, therefore, both from an educational and a financial standpoint, to longer continue the duplication of training given elsewhere. In the future applicants unable to make the college entrance requirements can be admitted to the vocational schools of agriculture, home economics, and mechanic arts.

SCHOOL OF AGRICULTURE—The two-year course in the School of Agriculture was offered for the first time in the fall of 1911. Fifty-six students registered in this course in the fall of 1911, and thirty-five applied for admission in the fall term of 1912. The instruction in the School of Agrictulture is vocational in character and is designed to train young men for the profession of farming. Applicants are admitted from the common schools.

SCHOOL OF HOME ECONOMICS—This course of two years, offered for the first time in the fall of 1911, is designed for the training of young women in the science and art of household management. Students are admitted from the common schools. The three-year college course in home economics has been discontinued.

SCHOOL OF MECHANIC ARTS—The two-year course in the School of Mechanic Arts is designed to give instruction in wood working, wood turning, pattern making, forging, shop work, and mechanical drafting. Two years of high school preparation are required for admission. The three-year college course in mechanic arts has been discontinued.

ABANDONMENT OF WINTER COURSES—The short winter courses in dairy husbandry, poultry husbandry, and horticulture have been abandoned on account of the lack of dormitory and class-room accommodations. These courses have attracted many students in the past, 285 having received instruction therein, and it is to be regretted that the courses cannot be continued. There are many young men and women who cannot afford the time or expense of even the two-year course in the School of Agriculture, but who could manage to enter for six weeks' or three months' instruction in the winter short courses. An attempt was made last year to provide for the demand for short-time special instruction in agriculture by offering courses of one week in length away from the college at various points in the state. The experiment demonstrated the demand for such instruction as well as the inability of our faculty to carry on such work without neglecting the duties of instruction to regular students at the college.

MOVABLE SCHOOLS OF AGRICULTURE—Short courses in agriculture of one week in length were held at South Manchester, Enfield, and Danbury in the winter of 1911-12. Applications for schools were received from Windsor Locks, New Haven and Old Lyme. The attendance at the various sessions ranged from thirty to seventy-five. The members of the college faculty, however, cannot be detailed as teachers in the movable schools of agriculture without impairing the efficiency of their work at the college. The interest in the lectures and demonstrations was such as to warrant the continuance of this line of work whenever funds are available for the employment of a separate corps of extension teachers.

EXHIBIT AT FAIRS—This year and the year preceding an exhibit illustrating the work of the several departments of the college was made at the Charter Oak Fair, Hartford, and the State Agricultural Fair at Berlin. A special tent has been purchased for housing this exhibit.

ORCHARD DEMONSTRATION—In co-operation with the State Pomological Society, the college has undertaken to carry on demonstration work in orcharding in various parts of the state. The plan as outlined contemplates demonstrations in the renovation of old orchards, proper methods of pruning, spraying, and cultivation of trees, and the grading and packing of fruit. Three orchards have been selected, one at Pomfret in the eastern part of the state, one at Cheshire in the central, and one at Bethel in the western division. It is expected that these orchards will be the center of interest in the communities where located and will be used as places for field meetings by the State Pomological Society.

FARMERS' INSTITUTES—The college is interested in farmers' institutes for the reason that members of the faculty and station staff are frequently called upon to take part in the programs. In the past farmers' institutes have been conducted by several organizations acting independently—Board of Agriculture, Dairy Association, Poultry Association, Pomological Society. This plan has resulted frequently in a duplication of effort and a loss of efficiency. Last year delegates from the several agricultural organizations met in conference and an

"Advisory Board" was formed to have charge of institutes to be given in the winter of 1911-12 by the associations having membership therein. The agricultural college, the two experiment stations, and all state agricultural organizations, with one exception, co-operated in this movement and became members of the Advisory Board of Farmers' Institutes. The president of the college was elected president of the institute board. The trustees of the college approved of a membership being taken in this organization and appointed the president to act in their interest and to represent them in meetings of this organization. An appropriation of $250 was made from current funds to meet the tax levied by the advisory board for financing the institutes for one year. The plan worked well and to the satisfaction of the organizations interested therein, and the co-operation is to be continued for the year 1912-13.

BOARD OF TRUSTEES—There has been no change by appointment in the personnel of the board. The Senate in 1911 reappointed E. Stevens Henry, George A. Hopson, and Lewellyn J. Storrs as trustees for a period of four years; the Board of Agriculture re-elected D. Walter Patten in 1911 and again in 1912; the alumni in June 1911 re-elected Arthur J. Pierpont for a period of four years.

ADDITIONAL BY-LAWS, BOARD OF TRUSTEES—The following by-laws were adopted by the board of trustees, March 26, 1912:

"The compensation of the secretary of the board shall be $200 per annum; the compensation of the treasurer shall be $400 per annum; and the compensation of the auditor shall be $5 a day while so employed. No compensation shall be paid to any other member of the board of trustees, but this provision shall not apply to a vote passed by this board, March 26, 1912, fixing the salary of the trustee manager* of the Gilbert Farm for the year commencing April 1, 1912.

"No supplies for the Connecticut Agricultural College shall be purchased from any trustee of said institution, nor from any partnership in which any trustee may be a member, nor from any corporation in which a trustee of said institution may hold stock."

ONE DIRECTOR FOR THE TWO EXPERIMENT STATIONS—The Connecticut Agricultural Experiment Station and the Storrs Agricultural Experiment Station each receives one-half of the annual federal appropriation of $30,000. for "original research and experiments bearing on the industry of agriculture."

At a meeting of the board of trustees, November 28, 1911, the president of the college submitted a report by request relative to the feasibility of consolidating the two experiment stations. At a subsequent meeting of the board a similar report was submitted by Dr. E. H. Jenkins, Director of the Connecticut Experiment Station. Both reports were received and tabled for consideration at a future time.

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*The president of the college is now acting as manager of Gilbert Farm, and a member of the faculty is now acting as treasurer of the college, in both cases without extra compensation."

There are many reasons for a closer union of the two institutions established for a common purpose. Efficiency and economy of effort and harmony of purpose would be promoted by the appointment of a single director for both stations.

At a meeting of the board of trustees of the Agricultural College held November 8, 1912, the resignation of L. A. Clinton, director of the Storrs Station, was accepted. At the same meeting a committee was appointed to confer with the board of control of the New Haven Station to consider and report on the feasibility of operating the two stations under one head.

CHANGES IN THE FACULTY—

Resignations: F. H. Stoneburn, professor of poultry husbandry, March, 1912; L. A. Clinton, director of the Storrs Experiment Station and professor of agronomy, December, 1912; Miss Susy D. Rice, steward, August, 1912; William M. Wilson, florist, March, 1911; W. J. Lane, instructor in chemistry, June, 1911; H. E. Penfield, instructor in poultry husbandry, August, 1912.

Appointments: William F. Kirkpatrick, professor of poultry husbandry, March, 1912; John L. Hughes, instructor in chemistry, September, 1911; Gerauld Manter, instructor in entomology and zoology, September, 1912; George A. Blake, superintendent of buildings, October, 1911; Harold J. Bower, instructor in agronomy, June, 1912; Rev. Lewis G. Rogers, chaplain, May, 1911; Sherman P. Hollister, instructor in horticulture, September, 1911; R. E. Jones, instructor in poultry husbandry, August, 1912; B. W. Wells, professor of botany, September, 1912.

Promotions: George H. Lamson, associate professor to full professor of entomology and zoology; Howard D. Newton, from associate professor to full professor of chemistry and physics.

Leave of Absence: A. F. Blakeslee, professor of botany, for one year.

NEEDS OF THE COLLEGE—At a recent meeting of the trustees the needs of the college were considered, and it was voted to request the General Assembly to make appropriations for the following purposes and in the amounts named:

College for current expenses	$70,000
Agricultural extension	25,000
Experiment station	15,000
Interest on land grant fund	13,500
For improvements	
Water, sewage, and fire protection	50,000
Buildings and equipment	
Auditorium, armory and gymnasium	60,000
Farm machinery and engineering	50,000

Infirmary	10,000
Faculty cottages	15,000
Coal bunker	10,000
Forging shop and equipment	6,880
Apple storage and refrigeration	5.000

CURRENT EXPENSES—The college received from the state for current expenses $15,000 annually from 1897 to 1902; $20,000 annually 1903 to 1906; and $25,000 annually from 1907 to the present time.

The lengthening of the college course from two to four years, the addition of a two-year course, School of Agriculture, and the increase in the number of students necessitating a division of classes into sections, all tend to an increase in the number of instructors. The enlargement of the plant necessitates additional money for maintenance. A point has been reached where the trustees will be required to impose a tuition charge of not less than $100 per student or to secure an equal amount of revenue elsewhere, if the needs of the institution are to be properly cared for. A tuition charge is not to be seriously considered, and it is urged, therefore, that a request be made for an increase in the appropriation for the maintenance of the institution from $50,000 to $70,000 for two years.

AGRICULTURAL EXTENSION—As the term implies, agricultural extension is an activity that aims to extend directly to the farmer the results of scientific research and experiment. The demands upon the college faculty for speakers at farmers' institutes and granges often necessitate an abandonment of class schedules at the college and result in detriment to the instruction of resident students.

In co-operation with the Pomological Society the college has undertaken to carry on demonstration work in orcharding. The plan as outlined contemplates demonstration in the renovation of old orchards, proper methods of pruning, spraying, and cultivating trees, and the grading and packing of fruit. Three orchards have been selected, and it is expected that they will be the centers of interest in the communities where located, and will be used as places for field meetings by the State Pomological Society.

The Lever agricultural extension bill now before Congress passed the House of Representatives August 23, 1912. It was read twice in the Senate, August 24, and referred to the committee on agriculture. Concurrent with the introduction of this bill in the House it was introduced in the Senate by the Hon. Hoke Smith, senator from Georgia, as Senate bill 4563. The bill (1) provides for the establishment and maintenance of an extension department in all colleges of agriculture; (2) outlines the duties, viz., to give instruction and demonstrations in agriculture and home economics to persons not attending the agricultural college, by field demonstrations and otherwise in the various communities; (3) provides for a fixed appropriation from the federal treasury of $10,000 a year to every state unconditionally, this appropriation to be increased each year by the sum of $300,000, until the maximum of $3,000,000 is reached in 1923. No state will receive its pro rata until it appropriates an equal amount of money for the same purpose. The money goes to and is expended by the state college of agriculture in each state. At least 75% of the money must be used for actual field demonstrations. It is believed that this bill will be passed by the Senate and become law during the present short session of Congress.

The Department of Farm Management, U. S. Department of Agriculture, is willing at the present time and has proposed to co-operate with the Connecticut Agricultural College in extension work. The Bureau of Farm Management will pay one-half the salary and one-half the office and traveling expenses of a state superintendent of agricultural extension. They are willing further to pay $1,200 toward the salary of an agricultural adviser, one in each county, provided the college pays one-half the salary and expenses of the state superintendent, and the additional salary, if any, beyond $1,200 of the county advisers, and the expenses of the county advisers.

In view of the urgent and insistent demand on the part of the farmer for advice and information, the demand for speakers at institutes, agricultural meetings, and granges directed to the college, and the demand for other extension service, all of which interfere with the regular work of members of the college faculty and station staff, it is important, if not necessary, that an active extension department be created at the college with a superintendent and a separate corps of instructors. It is urged, therefore, that the trustees request an appropriation from the present legislature for agricultural extension in amount not less than $25,000 for two years, to the end that the college may receive the federal aid in equal amount for this purpose.

EXPERIMENT STATION—The experiment station is a research department of the college. It is supported, however, by separate and distinct funds. The principal lines of investigation at the Storrs station are in dairy husbandry, poultry husbandry, horticulture, dairy and soil bateriology. A field of twenty acres has been set aside and is now being drained and prepared for farm crop investigation. An increase of $6,000 for two years in the appropriation is needed for this work.

The Storrs station was established in 1887. During the period since then the station has received $240,000 from the federal government, while the state has contributed $35,700. The federal government has contributed, therefore, $6.58 to each $1 appropriated by the state. The federal funds were intended to form a nucleus of a fund to be supplemented by larger and larger appropriations from the state. The failure of the Storrs station to receive more liberal appropriations from the legislature is evidence of false economy or a lack of appreciation of the value of experimental research to the advancement of agriculture.

STUDENT INFIRMARY—The college buildings are located on high grounds with good natural drainage. The water supply is pure, and the sewage system is modern and adequate. While the natural sanitary conditions are excellent, yet when so many congregate various diseases may be brought by the students themselves. Complaint is madé that there is no one to care for students in case of sickness. The charge of $5 per visit by Willimantic physicians is a severe tax on the resources of many with limited means. Nervousness or timidity has been the cause of the temporary withdrawal of a considerable number of the student body in the case of the alarming symptoms or even false report as to the nature of the illness of a single fellow student. A small infirmary well equipped with hospital furnishings and medicine should be provided for the control of contagious diseases and for the care of other cases of illness or injury. A tax should be laid upon the students sufficient to secure the services of a resident nurse.

COAL BUNKER—The college uses during the year about 1,500 tons of coal, which is hauled by team from Eagleville at a cost of $1.25 per ton. This coal is purchased for delivery largely during the winter months in order that farm teams otherwise idle may be used to advantage, and for the further reason that present storage capacity is inadequate; not more than one-third of the amount consumed during the year can be stored at any one time. The minimum price of coal, however, is in April, when the roads are usually impassable for heavy teams, after which the price at the mines advances at the rate of ten cents a month for five months. The maximum price then prevails during the remainder of the year. Cars are often delayed in transit and bunched in delivery, with the result that demurrage charges are unavoidable. A saving in the first cost and in the delivery of coal can be made if the supply be purchased at the minimum price, stored at Eagleville, and hauled at times when the farm teams are not in use.

FACULTY COTTAGES—There is need of additional cottages for the accommodation of the faculty and their families. No provision having made by the state for the lease of building sites on the campus at the Connecticut Agricultural College, it is necessary for the trustees to erect a sufficient number of dwellings for the members of the teaching and experiment staff. Cottages costing about $5,000 are leased at $300 per year, which is at the rate of 6% on the investment.

AUDITORIUM, ARMORY AND GYMNASIUM—

AUDITORIUM—The audience room or chapel in the main building will comfortably seat 175 persons. An auditorium is needed to accommodate the people who attend the exercises at commencement week, the annual summer gatherings of the dairy, poultry, and horticultural conventions, and to provide accommodations for lectures, entertainments and social gatherings, attended by students and faculty during the college year.

ARMORY—The federation enactments establishing agricultural colleges prescribe that instruction be given in military tactics. The acceptance by the state of the income from the Morrill, Nelson, and the original land-grant acts, amounting to $56,750 annually, predicates a willingness on the part of this state to comply with the terms of the enactment and to provide suitable accommodations and facilities for said instruction. Furthermore, the federal government furnishes arms, targets, ammunition, an officer from the active list of the U. S. army is delegated to give military instruction, quarters are provided for said officer, and all without expense to the state or college. An auditorium could be used for military purposes. Suitable quarters for conducting military drill provided by the state would be but slight recognition of the benefits received from the federal government for facilities for instruction in military science.

GYMNASIUM—It has been urged that students of an agricultural college, strong and robust of health, have little need of athletics or of a gymnasium. But it should be remembered that the change from the activities of the farm to the sedentary conditions of the laboratory and class room is most marked, and the need for systematic exercise is greater than in the case of a college boy from the city.

A building suitable for an auditorium, armory, and gymnasium is one of the urgent needs of the Connecticut Agricultural College.

WATER, SEWAGE, AND FIRE PROTECTION—

SEWAGE—The buildings of the Connecticut Agricultural College are located on a water shed. From the eastern slope the drainage finds its way into the Fenton river, the source of the Willimantic water supply, and to the Willimantic river from the western slope. The sewage from the college buildings must be filtered or become either a nuisance or a danger to public health, or both. At present the sewage from Storrs Hall, Grove Cottage, Gold Hall, Main Building and Dining Hall is purified on a filter located on the western side of the water shed. This filter bed needs to be enlarged to care for the sewage from the remainder of the college buildings and faculty residences.

WATER—Water for college purposes is obtained from a well 800 feet in depth, and is raised to a tank 60 feet above the surface of the ground. The tank has a capacity of 30,000 gallons. The consumption for the past year has averaged 25,326 gallons daily. The pump has a capacity of 1,800 gallons per hour, requiring 14 to 15 hours operation to supply the daily demand. Frequently the amount of water in the tank is not more than that needed for 12 hours' consumption, and at best not more than the amount used in any 28 hours. A storage tank with capacity for at least seven days' supply is necessary to insure service in the case of a breakdown to the pump or engine.

FIRE PROTECTION—The college comprises 29 buildings that are insured at a total amount of $276,750. New buildings have been authorized by the legislature that will bring the insurable value within a year up to $400,000. The present rates of insurance run from $1 on the Main Building to .60 on Storrs Hall, and average about .73 for all buildings and contents. Frank B. Sanborn, civil engineer, Tufts college, reports: "These rates in my judgment are as low as could be expected under present conditions, and doubtless they would be quickly raised by the insurance companies if a large fire should occur.

"The cost to the college is now about $2,000 a year for insurance. This is a little over double what the same amount of insurance would cost under present rates at Amherst, Williams, and Wesleyan colleges. These colleges have a blanket clause which would permit them to insure nearly all buildings at a flat rate of .33 1-3, or in other words, instead of $2,000 a year the cost to the above colleges would be $900. [In the case of $400,000 of insurable property, the saving in insurance would amount to $1,600.]

"With adequate protection and other improvements as recommended in this report, I believe that the insurance could be obtained for less than $900 per year.

"Besides questions of the cost of improvements and the savings in dollars and cents by lower rates of insurance there is another important factor that must be considered by the trustees and others who are directly responsible for the welfare of the college, namely, protection of the lives of students. In a sense the parents who send their sons and daughters here to college are placing them in the safe keeping of a state institution. It is expected that the state will provide such construction of buildings, occupancy, fire protection, and general order (including management) as will insure the safety of both the lives and property of students."

FORESTRY DEPARTMENT—During the mild weather of the fall and spring months wood can be used to advantage as fuel in the furnaces of the college buildings. A conservative estimate is that 1,000 cords of wood could be used each year during the months of October, November, April, and May, reducing the amount of coal to the extent of 500 tons.

The college has from 250 to 300 acres of woodland. Adjoining land suitable for purposes of forestry can be acquired by purchase. It is recommended that a department of forestry be created and that a forester be engaged who shall give instruction to students in the college and in the school of agriculture and who shall have charge of the woodland now owned by the Connecticut Agricultural College.

FORGING SHOP AND EQUIPMENT—A course in forging is offered to the students of the School of Agriculture and to the students in the School of Mechanic Arts. At the present time the equipment of ten forges with anvils and necessary tools is installed in a leased shop near the campus. The equipment is meagre, and the accommodations are insufficient for the number of students registering for this work. It is recommended that a building 62 x 34 ft., 12 ft. high, be erected, to be located near and conform in style of architecture to the mechanic arts building. The cost of such a structure is estimated at $5,000, and of equipment at $1,880.

FARM MACHINERY AND ENGINEERING—The scarcity of farm labor makes the employment of machinery on the farm a necessity. Much of this machinery is elaborate and complicated in construction, requiring mechanical skill and genius for its efficient operation. It represents a considerable amount of capital on which the farmer must pay interest. There is also a considerable waste due to neglect and unskilful handling of this part of the farm equipment. It is important, therefore, that the students of an agricultural college receive training and instruction regarding the construction, care and economical use of farm machinery. A full line of farm machinery for instruction purposes can be obtained without cost to the college, as most manufacturers are willing to lend their wares for exhibition purposes.

Class rooms and laboratories are needed for instruction in (1) properties of materials; (2) drainage; (3) irrigation; (4) farm implements, machines, and motors; (5) roads and bridges; (6) farm buildings and fences; (7) farm sanitation.

FRUIT STORAGE AND REFRIGERATION—A refrigerating room and a packing room for fruit are needed as an addition to the equipment of the horticultural department. With the crops now harvested there is much waste and loss of fruit due to improper facilities for handling and packing. The cost of fruit storage and refrigerating rooms is estimated at $5,000.

NEED OF FUNDS FOR SCHOLARSHIPS—Many inquiries are received each year from young men desiring to enter college regarding the opportunity for working their way through the institution. So far as possible we do find employment for deserving and needy students, but there are many such requests from young men whom we are not able to furnish with employment. Registered students are occasionally forced to withdraw before completing their course because of the lack of funds or the opportunity to earn money. One of the urgent needs of the institution is a fund which may be used to supply loans or to be given as scholarships to worthy young men and women.

LOUDEN LOAN FUND—The sum of $200, the gift of Elizabeth Valentine Louden, is available for the assistance of worthy students to enable them to finish their courses in college. Applications for loans must be made in writing, addressed to the president of the college.

Respectfully submitted,

CHARLES L. BEACH, President.

Report on Sewage and Water Supply Problems

Mr. Charles L. Beach, President, The Connecticut Agricultural College,
Storrs, Connecticut.

Dear Sir:

As requested in yours of the 24th inst., we give below the opinion of our organization regarding your sewage and water supply problems.

Summarizing as briefly as possible, we recommend that you should

1. Enlarge present sewage filter beds.
2. Build sewer from road below dairy-barn across the present sewer.
3. Put in compressed air pump near Rosebrooks cottage to lift everything which above sewer will not take by gravity to present filters.
4. Remove present deep well pump, tank and tower and do not re-erect same.
5. Put in larger deep well pump, discharging to steel water tower on hill.
6. Consider fire protection for new buildings, at least so far as to make possible future installation of hose racks in corridors on each floor.

Our reasons for the above recommendations and the details necessarily involved are given below.

SEWAGE PURIFICATION

Your present system of filtering sewage through sand-beds cannot be improved upon, but the beds have, of course, been outgrown. We would suggest doubling their area immediately, and provision should be made within five years, or within the time when expected new buildings and increased number of students shall have doubled the amount of water used, for making the total area of beds three times what you now have. Before making this second enlargement, however, we would seriously consider the economy of putting in a settling tank designed according to the experience which by that time will have been had with tanks now being constructed. If such tanks work, as sanitary engineers now anticipate, it would enable you to filter twice as much sewage through a given area as you otherwise could, it would allow you through the winter to discharge a very much less objectionable effluent into the brook, and would give you a fine black inoffensive sediment which could be disposed of more easily than the rakings from the sand-beds and might even have considerable value as a fertilizer.

SEWAGE FROM EAST WATERSHED

The more we consider the question of disposing of the sewage which is outside the natural watershed now draining on to these beds, the more firmly we are convinced that you should not discharge any of such sewage into streams flowing to the east. In connection with a preliminary report for a committee of the Willimantic Court of Common Council, the writer has recently had occasion to examine very carefully the water supply system in that city. There is no question but that conditions are ripe for a serious epidemic of typhoid which may visit Willimmantic at any time. If by any chance you should have a case of typhoid on your watershed and should be discharging your sewage, or any part of it, in such a way that it ultimately reached the Fenton river, we think there is no doubt that the city of Willimantic would make you a great deal of trouble and would probably be in a position to cause you to change your system of sewage disposal.

Entirely aside from the above considerations, however, it is always more economical to purify sewage in one plant than in two, and in your case we think the first cost necessary to get the sewage over to your present filter beds is not great enough to justify the increased expense of operating two purification plants. The writer understands from your Mr. Wheeler that it will probably not cost over a thousand dollars to build a twelve-inch sewer on a grade not less than three-tenths of one per cent. from the road south of Phelps cottage across to a connection with your present sewer. We would suggest making comparative profiles and cost estimates over several possible routes, one perhaps south of the Church and Experiment Station Greenhouse, where there would be much less cutting and probably less rock than on a route north of the cemetery. A comparatively shallow sewer might be brought south from the farm buildings and in the rear of Agricultural Hall to connect with such an east and west sewer which would be within convenient reach of the new building which might be built opposite the church. We do not know but perhaps you have already tried these routes and decided on the most economical. In any case all sewage that can possibly be picked up should be taken across by a gravity sewer. If you build new buildings near Phelps cottage or Valentine cottage No. 2, the sewers from which are too low to reach this sewer, then you should connect the plumbing of the upper floors to it and connect to the low level pumping system only such fixtures as are necessarily located below the high level system.

SEWAGE PUMPING STATION

Many buildings, present and prospective, located at the south end of your plant, are too low to make a gravity connection to the present filters a possibility; in fact the Horticultural Hall and any plumbing fixtures in the Greenhouse should probably be connected to a pumping station. We would recommend that some form of sewage lift, similar to the Priestman ejector, be installed underground below the lowest point you feel you are likely ever to need to sewer. This would be operated by an electrically driven air compressor similar to those used in trolley cars, and the whole could be underground if necessary, or better could be housed in an inexpensive and ornamental pavilion over the ejector pit. These ejectors have been largely used for many years to lift sewage from the sub-basements of office builings in large cities where the sewers are at the ordinary depth. There are no moving parts in contact with the sewage, and they give excellent service. As the compressed air is used expansively they are fairly efficient. Centrifugal or reciprocating pumps are more efficient in places where the flow of liquid to be pumped in constant, but in such cases as yours, where the pump would stand practically idle all night, there is a great deal of sediment during the idle period which interferes materially with the action of moving parts of pumps, and they are not as efficient as the ejector and give more trouble. We estimate that fifty gallons per minute would be the maximum amount which an ejector would be called upon to handle after the proposed new buildings have been completed. If a smaller pump was used it would be necessary to build a storage well which would be more or less expensive and might be objectionable. Without the storage well there is no standing sewage whatever outside the chamber of the pump. Six-inch cast iron pipe should be used for the discharge main from the pump straight up the hill on the shortest possible route to an elevation from which tile pipe could be laid to connect to your present system. As the lift main will have to stand full of sewage and is expensive, it should be kept as short as possible. We have corresponded with the Merritt company, the makers of the ejector to which we refer, and enclose a circular which they have sent us. They estimate that the equipment we specified could be installed under a house approximately six by seven feet square for a price for the complete installation not to exceed thirteen hundred and fifty dollars ($1,350). The sewage would be brought to the pumping station through six or seven-inch tile laid in the ordinary way. We would be particularly careful, however, to make the sewer as watertight as possible and would, of course, absolutely prohibit connecting any roof-water. This applies to all sewers which connect to your filter beds as well as to those discharging into the pumping station. It increases the work of purification to dilute the sewage, because the capacity of the plant is limited by the amount of water which can filter down through the sand. We would recommend that in all future construction you use vitrified tile in three-foot lengths with deep and wide sockets very carefully filled with stiff mortar made with one part Portland cement to one part of sand; and we suggest that you take the first opportunity to rebuild certain parts of your system which we understand are not built this way, especially where the water runs through water-bearing soil. The roof water from your large buildings can easily be discharged into pits filled with cobble stones, which in your gravelly soil would not be objectionable; or where this is not feasible, a shallow tile drain can be laid to the nearest water course.

We have made a number of cost estimates covering the above work, but as they are safe for purposes of comparison only we do not give them. We suggest rather that you decide exactly what buildings it is desirable to connect to this pumping station and what future buildings it is wise to provide for, and then design the sewer system and locate the pump well in the most economical manner to accomplish the desired results. We should think that a sewer from Cottage No. 8, running northerly, could be so laid as to pick up all existing and proposed buildings on the campus, and that another sewer in the highway would connect with any other buildings which you may wish to drain and would be in a position to serve as outlet for a future sewer to serve cottages which may be built further south.

PRESENT WATER SUPPLY

Your present 30,000-gallon tank is, of course, entirely inadequate. On one day last October you used 30,680 gallons, and as you have no break-down service whatever the result of any damage to the pump might be serious. We understand that the hill north of your farm has practically the same elevation as the present tank, and we have assumed this for purposes of figuring as elevation 700 where the surface of the ground under the present tank is elevation 630. We think this is the best location for a reservoir, because the hill to the north is not enough higher to justify the added expense of using it and the hill to the east is further away with no better elevation. We think a storage reservoir on this hill is the first improvement over your present system which you should consider. A storage well near the buildings with a pump discharging directly into the mains as the water was used would have a lower first cost but would give you no assurance against break-down, which it is most important for you to have. We think that your present equipment, while probably adequate for the day when it was put in, has entirely outlived its usefulness, and we do not recommend trying to use the pump or working head in any other situation. The tower, tank and windmill could be set up near the dairy-barn and used to pump water from your under-drain system for barn purposes only. You would need to buy a new pump suitable for working with a small suction lift, and we estimate the cost of taking down the present tank and tower as carefully as would be necessary for re-erection and re-assembling it on new foundations as not less than one thousand dollars or, including the pump, probably about fifteen hundred. We do not advise this for two reasons; first, because the water from shallow drains under manured lands would not be safe for drinking purposes; and, second, we do not think you need this additional water supply. We know from personal experience in Hartford factories that careless people will drink from a polluted supply no matter how carefully it is posted. Some boy whose duty keeps him at the barn will occasionally drink from the faucets instead of taking the trouble to go a little farther to a safe supply. Most of the danger would be when rain-water, washing along the surface, became polluted and afterward found its way down through rather definite channels to the underdrains, such, for instance, as ground that had settled at the side of a drainage ditch. The water that filtered through two feet of undisturbed ground before reaching the underdrain would be perfectly safe, and this very thought of safety would make the boys more ready to use the supply which occasionally might be quite dangerous.

We do not think you need this additional supply because if the present well were overtaxed you would have heard from it before this. You could easily change the belting on your present gas engine and pump at double your present rate, but even if in such a test you did get air through the pump it would only prove that at that particular time the well would not yield water at so high a rate of pumping with the pump cylinder at its present location. If the pump cylinder, instead of being set eighty feet below the surface, were set one hundred feet below, it would certainly increase the yield a little and might increase it a great deal. If pumping at the rate of sixty gallons per minute, or thirty-six hundred gallons per hour, for five hours exhausts the well, it does not mean that the well will yield only eighteen thousand gallons per day by any means. You might still be able to pump at the rate of fifty gallons per minute indefinitely, thus giving seventy-two thousand gallons per day if you pump constantly, and even this result would be changed by changing the elevation of pump cylinder. Any test made now would, of course, give a much better result than should be expected during the driest period of a dry summer.

Our recommendations regarding the use of the well would therefore be that you put in pump capacity enough to give you the maximum amount which the College will require and then take as near this amount as the well will yield, not developing the additional possibilities which you have until such a step becomes necessary. It is important to do no pumping by electricity between the hours of four and nine p. m. and it will be greatly to the advantage of the well to pump slowly the other nineteen hours of the day rather than rapidly for six or eight hours. Until your use of water grows you certainly will not need the additional supply, and we believe it would be better economy to store your present tank in a dry place knocked down where deterioration will be slight than to set it up and use it.

Regarding the saving in money by putting up this windmill. If the windmill is able to run for ten hours it would pump 7,500 gallons per day, and we estimate that this would cost not over ten cents per 1,000 gallons if pumped at maximum elevation from 100 feet deep in the well to the top of a 50-foot tank on the hill. This would make an annual cost of $275 for pumping by electricity. Against the free cost of pumping by windmill should be charged the investment on the first cost of fifteen hundred dollars and depreciation. If the life of the windmill be estimated at sixteen years more, the depreciation may be called 6% per annum and with interest at 6% we would have a charge against pumping by wind of $180 or an apparent saving of $120 per year, against which would be charged the increased cost of attendance and the disadvantage of the dangerous duplicate system of water suppy.

If there should prove not to be enough water in the well then an additional supply will be essential, and it might be worth while to disinfect the ground water supply and use the windmill, or if it is possible to use the water for condensing, or cooling, or power purposes in large enough quantities to make it an object and arrange the piping in such a way that it absolutely could not be used for drinking, then it might pay to set up and use the windmill. This could easily be done were you operating your own power plant. At present we feel inclined to advise against the use of the windmill.

FIRE PROTECTION

We do not know that at present you have any fire protection, and we think that the water supply system should be laid out with this as a dominant consideration. We believe it would be good insurance if everyone of your buildings had an automatic sprinkler system. It is the usual practice today to install these even in ordinarily good factories; in fact the lower insurance rates cannot be secured without them, and every store and warehouse which contains inflammable material has them as a matter of course. They require a minimum pressure of twenty pounds to the square inch, and before deciding finally on the water level of any reservoir you build on the hill, we think you should very carefully consider whether some time in the future you may not wish to put in some fire fighting apparatus in at least the best of your buildings.

We believe that a standpipe with racks of hose on each floor of your dormitory buildings, coupled with a proper fire drill, would be a great protection against fire, and it is not unlikely that something of the kind may be required by law in the not distant future. Twenty pounds pressure would be adequate for a fire stream for use through short hose lengths inside the buildings. An ideal installation would be an elevated tank furnishing water under pressure by gravity and an independent supply, such as an underground tank supplied from a spring with an automatic pump which on an alarm of fire would immediately discharge high pressure water from this well into an automatic sprinkler system.

The only present cost of considering such a system would be that it would necessitate a tower probably fifty or sixty feet high, instead of a low covered reservoir. We do not think that there would be a controlling difference between the cost of such a tank and the lower and larger reservoir, though such difference as there is is in the favor of the low tank. Before recommending exactly the dimensions of the tank we should need to know the exact elevation of the hill and the elevation of the upper floors of your principal buildings, but for preliminary purposes we feel safe in assuming that a tank sixty feet high and thirty feet in diameter would be tall enough to give you over twenty pounds pressure at the highest point of any future sprinkler system you might install.

We estimate that a steel tank of this size would cost around seven thousand dollars, and it would be large enough to hold 316,000 gallons and would furnish four hours supply for four standard fire streams and in addition three days domestic supply at the present daily rate of 25,000 gallons. At the rate of 50,000 gallons per day, which you will certainly reach within a few years, it would furnish a six days supply. This quantity is about the minimum which it would be safe to store for fire protection purposes, and we think with a six days domestic supply it would be unnecessary to provide duplicate pumps, as there would always be opportunities to make ordinary repairs before the stored water became exhausted. Of course, the pressure from the last of the water in the bottom of the tower would be too little for a proper fire stream, but we apprehend that before you have a much larger domestic consumption, which would tend to draw the tank down, you will decide to put in your own power plant and will include in it a fire pump which would make all the water stored in the tank available under proper head.

DEEP WELL PUMP

To take the place of the present deep well pumping outfit we would recommend an entirely new double-acting 60-gallon pump and working head to be driven either by your present gasoline engine or by an electric motor. We presume that the present single-acting 30-gallon pump was put ih as being the largest that the windmill could be depended upon to drive, but it is a noisy, uneconomical type of pump which very rapidly wears out, and we think that your gasoline engine is powerful enough to drive a properly designed double-acting pump having twice your present capacity.

We think it would be easy to arrange the working head so that it would stand in a pit below the present floor of the pump house and have the pulley wheels on a level with your present shafting. This would allow you to keep the present pump house without change until you are ready to build something more ornamental. If you wish to do so you could sink the whole of the machinery entirely underground You will find, however, that a modern pumping head for a double-acting pump built with bearings large enough to stand the load brought upon them is by no means the noisy proposition which you at present have, and we should favor keeping the motor and gas-engine above the level of the ground because they are then so much more accessible. You should discharge from this pump into your present piping system laying a new single line of eight-inch cast iron pipe from the tank on the hill down to the nearest four-inch water main which you now have. These sizes will be large enough for present purposes and later, if you put in a fire pump, you can lay an additional eight-inch main from it to replace such of the four-inch pipe as may be necessary.

COSTS

In reaching the above conclusions we have made many cost figures necessary for purposes of comparison which would probably not be suitable for use in deciding upon the size of appropriation necessary for carrying out definite parts of the program suggested. We believe that we can be of the greatest service to you by suggesting the controlling reasons for and against, and the comparative costs of the different courses of action open to you without befogging the issue with cost figures on structures you may never build. After you have decided upon the policy you think it best to pursue we should be glad to be of service in suggesting the best ways of working out the details, and we can give you accurate cost estimates of any part of the work which you think at any time might be of service to you.

Very truly yours,
FORD, BUCK & SHELDON, Inc.
By Henry R. Buck.
Hartford, Ct., January twenty-ninth, Nineteen Hundred and Twelve.

Report on Water Service and Fire Protection

Tufts, College, Massachusetts, August 24, 1912.

The Connecticut Agricultural College, Storrs, Connecticut.
Charles L. Beach, President.

Dear Sir: The following report pertains especially to a proposed system of water pipes with an elevated tank, which are intended to provide both water service and fire protection.

The information and recommendations presented in the report are based on an inspection of the college buildings, conferences with yourself, Professor Wheeler, and later with insurance representatives.

The plan that accompanies this report shows the general features of the recommendations, the location of buildings, and of roads, the ground elevations of various parts of the yard, a proposed system of water pipes with an elevated tank, numerous hydrants and connections for automatic sprinklers in six of the buildings. The plan is drawn to a scale of 1 inch=100 feet and is 30 x 57 inches in size.

The four leading elements that make up the quality of a fire risk are: Construction, Occupancy, Fire Protection, and General Order (including management).

CONSTRUCTION

A few of the buildings are well constructed from a fire protection viewpoint. These buildings constitute about one-fourth of the total insurable value. Storrs Hall, which is a new dormitory, is built of brick, has expanded metal and plaster with an attic that is open joisted. Two division walls extend to the roof—not through it—and have no fire doors in the basement. There are open stairways.

Mechanic Arts and Horticultural Hall, although not representing the best forms of construction, would be classed as good.

On the other hand half of the insurable value is of unfavorable construction. In this class first of all is Main Building. It represents one of the old types of construction: wooden walls with hollow spaces, joisted hollow floors plastered, or sheathed, where a fire could travel without being easily stopped; and with an attic space partly occupied and which would be difficult for firemen to enter during a fire.

Similarly Gold Hall, Whitney, and Grove are dormitories of wooden, hollow construction with attics. It would appear that architects and builders for the College have persistently adhered to hollow forms of construction and pitch roofs, and in none of the buildings yet built have they embodied the more important fire protection requirements.

New buildings should be of slow burning construction—not necessarily at materially increased expense but embodying modern methods of fire stops at floors and at division walls, no hollow spaces, attics, nor open stairways.

OCCUPANCY

The occupancy as it exists at the present time is not particularly hazardous. In the course of my inspection through nearly all of the buildings only a few objectionable features were noted: A 100-gallon kerosene tank, cylinder and machine oil now kept in the basement of Main Building should be kept outside in a regular oil house. At the same time the wood shop, machine and repair rooms now in the basement of Main Building could well be removed to another building.

Gold Hall as well as many of the other buildings has heaters in the basement that are objectionable. (These would be displaced were a central plant put in.)

In the basement of the Chemical Laboratory there is a heater, a gasolene mixer, and an experimental room which add materially to the hazard of the buildings. (The rate of insurance on this building is 1.50—one of the highest rates on any building except greenhouses.)

But compared with many city risks or commercial plants that have a variety of tenants, all sorts of hazards, and uncertain conditions this occupancy possesses few features that are seriously objectionable.

(All buildings now have incandescent electric lights, a new system having just been completed.)

FIRE PROTECTION

The present fire protection that could be used would have to consist principally of fire pails and chemical extinguishers. There are no hydrants, automatic sprinklers, fire pumps nor fire engines. (Willimantic is 8 1-2 miles away.) This lack of protection and no nearby city to call on for assistance increases the probability of a large fire and causes insurance companies to prescribe high rates of insurance.

During my visit at the College and subsequently in discussing the conditions with insurance companies, various proposals have been considered for providing adequate water service and fire protection:

1. Retain the present 30,000-gallon tank and add a fire pump and a reservoir for its water supply.

(The present tank is hardly large enough for daily requirements; at times it is less than half filled. A reservoir for a fire pump should contain three hours' supply—200,000 gallons—and thus cost about $1,500. A pump to be effective must have its power instantly available; steam up, electricity at the switch, or gasolene ready. At best a pump to force water up hill is not as satisfactory as an elevated storage supply from which water can run down hill).

2. Raise the present tank to a higher elevation and supplement by another tank of large capacity.

(The capacity of a second tank would need to be at least 100,000 gallons—three times the size of the present tank—in order to provide a good primary supply, and the advantages to be gained by raising the present tank to 50 or 60 feet higher elevation would hardly seem to justify the expense and interruption of service that would be necessary).

3. Leave the present system for the college and residence supply as now used and add a large elevated tank that would eventually serve for both water supply and fire protection.

(By leaving the present system without changes it could be utilized as at present for college and domestic supply while a new tank and pipes were being put in for fire protection and later the same would serve for both purposes of general supply and fire protection).

Of the above proposals the third one seems to have the most advantages and after careful consideration I have adopted it for presentation in this report.

Accordingly the essential recommendations for improving the fire protection are:

1. A 200,000-gallon steel tank on a trestle 60 feet high, located on a hill at the northerly part of the College property. This tank should comply with specifications for similar structures and could correspond in design to the one shown in the accompanying illustration.

Sterling, Colo.
Height, 103 feet. Capacity,
253,000 gallons.

2. A system of underground pipes consisting of 12-, 8-, and 6-inch pipes as shown on the plan.

The main line of 12-inch pipe is 2,700 feet long. This pipe would afford a flow of 1,750 gallons per minute or seven fire streams with a friction loss of 10 pounds per square inch; with ten fire streams the loss would be 18 pounds. Thus the 12-inch pipe would appear to be large enough for present conditions. When the College buildings draw their water supply through this pipe two less fire streams will be available at times of maximum flow.

The plan also shows the proposed location of hydrants. These have been placed at favorable places with regard to present buildings and those that are proposed.

3. Automatic sprinklers are suggested for six of the buildings.

The effectiveness of sprinklers is largely due to the fact that they are always on duty, and after a fire starts they operate in the smoke and heat where a human being could not survive. They thus protect both property and lives, and these facts have been in mind when recommending them for the following buildings: Throughout the Main Building, Gold Hall, Chemical Laboratory, Agricultural Hall (Creamery and Bacteriological Laboratories), and Mechanic Arts (now used for a dining hall and living rooms); and in the basement and attic of Storrs Hall (a boys' dormitory).

Grove Cottage and Whitney Hall (both dormitories or apartments) would be materially improved by having sprinklers put in all, or a part, of their rooms, but the suggestion does not seem urgent at this time.

4. Whatever the extent of other fire appliances it will be readily seen that a central Fire House is necessary.

A proposed location is shown near the center of the grounds—north of the present water tower; and for equipment I would suggest: 1,000 feet of 2½ -inch cotton rubber-lined hose, six 1⅛-inch Underwriters' nozzles, and minor equipment of axes, bars, and ladder straps as specified on plan.

Also an important item would be a chemical extinguisher of 32 gallons capacity that can be obtained as commercial outfit; it comes with hose attached and mounted on a two-wheel rig called a "jumper," which could be drawn by students or by automobile and would serve independently of the water supply and also be useful for outlying districts.

GENERAL ORDER (INCLUDING MANAGEMENT)

Important under this head is discipline. How strictly are rules and regulations lived up to? is a question that an insurance inspector is constantly considering when he goes through a large plant of this sort. Fires are bound to occur in places that are always neglected and insurance rates are adjusted to meet these conditions, but in the better classes of risks fires often occur on account of variable conditions—one time good, another overlooked or neglected; one time systematic, another experimental and out of place. In my judgment it is these last conditions that are apt to prejudice an inspector in going through some parts of this plant. In Gold Hall (boys' dormintory) there is lack of strict order; rules prohibit cooking in the rooms, but evidently it is done in some of the rooms, and kerosene stoves are used; Storrs

Hall (another boys' dormitory) and of good contruction, shows plainly the traces of "rough housing" which from the fire viewpoint is objectionable in so far as it introduces unexpected conditions.

It is difficult to prescribe exact rules for good order and management. An insurance inspector cannot easily tell what makes his impression FAIR in one case and GOOD in another; it is the sum total of many items that makes up the grading. Mechanic Arts, which is now used for a college dining hall and living quarters for the help, would be classed as in good order. There seems to be "a place for everything and everything is in its place." Such conditions help to lessen the chances of fire and materially aid in reducing the insurance rates.

COST OF IMPROVEMENTS

I submit the following estimate of cost of the improvements that are recommended in the report:

200,000-gallon steel tank and steel tower 60 feet high, average foundation		$8,500
2,700 feet of 12-inch pipe	@ $ 1.94	5,238
2,700 feet of 6-inch	" 0.98	2,646
4,825 feet of 8-inch	" 1.29	6,224
28 two-way hydrants	" 30.00	840
6 six-inch valves	" 13.00	78
5 eight-inch and 1 twelve	" 20.00	147
12 indicator posts	" 20.00	240
1 six-inch check valve		15
Fire House building, 40x50		2,000
1,000 feet of cotton rubber-lined hose	" 0.50	500
Fire wagon and minor equipment		300
Six nozzles	" 5.00	30
Chemical extinguisher with two-wheel rig		200
Automatic sprinklers		
Main Building	550@3.00	1,650
Storrs Hall	220 "	660
Gold Hall	300 "	900
Chemical	140 "	420
Mechanic Arts	150 "	450
Agricultural	260 "	780
		$31,818
Add 10% for expenses of supervision and engineering		3.182
Total for water supply system and fire protection		$35,000

Of the above estimate about $27,500 would be for the water-supply tank, pipes and auxillaries, and $7,500 strictly for fire protection.

INSURANCE

The College comprises 29 buildings that are insured for a total amount of $276,750. Besides these buildings there is furniture in residences, a church, and private dwellings not included in the above amount, so that the insurable value would exceed $300,000. New buildings have been authorized by the legislature that will bring the insurable value within a year up to $400,000.

The present appears to be an era of prosperity for agricultural schools. Last year there were 200 students in attendance here. The present size of the College is the result of 31 years' growth and the next 20 is likely to see a similar increase. I believe that it is advisable to install water pipes and a tank large enough to provide for developments that may be reasonably expected.

The present rates of insurance run from $1. on the main building to .60 on Storrs Hàll and average about .73 for all buildings and contents. These rates, in my judgment, are as low as could be expected under present conditions, and doubtless they would be quickly raised by the insurance companies if a large fire should occur.

The cost to the College is now about $2,000 a year for insurance. This is a little over double what the same amount of insurance would cost under present rates at Amherst, Williams, and Wesleyan colleges. These colleges have a blanket clause which would permit them to insure nearly all buildings at a flat rate of .33 1-3, or in other words instead of $2,000 a year the cost to the above colleges would be about $900.

With adequate protection and other improvements as recommended in this report I believe that the insurance could be obtained for less than $900 a year.

Besides questions of the Cost of Improvements and the savings in dollars and cents by lower rates of insurance there is another important factor that must be considered by the Trustees and others who are directly responsible for the welfare of the College, namely, protection of the lives of students. In a sense parents who send their sons and daughters here to college are placing them in the safe keeping of a State institution. It is expected that the State will provide such Construction of Buildings, Occupancy, Fire Protection, and General Order (including Management) as will insure the safety of both the lives and property of students.

Respectly submitted,

FRANK B. SANBORN,

Fire Protection Engineer.

ESTIMATES SUPPLEMENTING THE PRECEDING REPORT

Estimate I follows the recommendation of Prof. Sanborn of Tufs College, a Fire Protection Engineer. Forty thousand dollars would be the least amount which could be used to install a fairly complete system of fire protection in addition to the sewerage and water service. Fifty thousand dollars could be used to include other buildings, e. g., the Valentine house, the new boys' dormitory, and Grove Cottage and Whitney Hall.

Estimate II provides a storage of water and connections with the present system of pipes without regard to the fire protection feature.

Estimate III provides water service and sewerage and makes a beginning of a fire protection system. Under this plan the parts of the system which are constructed now will not have to be rebuilt later. This estimate could be reduced $1,700 by the omission of the automatic sprinklers, or increased by any amount to allow of an extension of the fire protection feature.

I think that a beginning should be made upon the fire protection system and that about $20,000 is the least amount which can be used economically for the sewerage, water service, and beginning of fire protection. I favor the third plan, if the first is too expensive.

Respectfully submitted,
CHARLES A. WHEELER

ESTIMATE I

Sewerage, Water Service and Fire Protection

Sewerage—A new line along faculty row from proposed Experiment Station building to Valentine house, with ejector to discharge to west watershed; new line from horse barn to Agricultural Hall and to present sewer with branch to Phelps house; connection for Whitney Hall; new filter bed size of present one; roof cut out	$5,000
Water Service and Fire Protection—200,000-gallon tank on trestle 60 ft. high, new mains, hydrants, automatic sprinklers, etc.	$35,000
	$40,000

(See report of Prof. Sanborn.)

ESTIMATE II

Sewage and Water Service

Sewerage (same as estimate I)	$5,000
Water Service.	
200,000-gallon tank on 60 ft. trestle, or standpipe of much larger capacity	8,500
Connections, 6-inch and smaller pipes	1,200

Double acting pump and installation	200
Incidental expenses 10%	990
Total	$15,890
	Say $16,000.

ESTIMATE III

Sewerage, Water Service and Partial Fire Protection

Sewerage (same as estimate I)	$5,000
Water Service and Partial Fire Protection	
Tank or standpipe (same as estimate II)	8,500
2,225 ft. twelve-inch pipe	2,450
300 ft. six-inch pipe	300
3 two-way hydrants	90
2 indicator posts and valves	70
1 check valve	15
500 ft. hose and nozzles	270
Automatic sprinklers for Agricultural Hall and poultry office building	1,560
Other connections	220
Incidentals, 10%	1,325
Total	$20,000

Horticulture and Care of Grounds

The starting of the School of Agriculture one year ago increased the number of classes to such an extent that more teaching force was required in the department, and Mr. Sherman P. Hollister, an old graduate and more recently from Cornell, was appointed as an additional instructor. Besides these classes the much larger number in the regular college courses has made it necessary to divide the classes into sections in laboratory exercises, and in some instances to shorten the hours to give all an equal amount of this instruction. This demand for more and larger rooms for class and laboratory exercises will soon render it obligatory to use more of the Horticultural Building for horticultural teaching to the exclusion of classes of other departments now being held there.

Two years ago a plan was made to concentrate the field operations of the departments as far as possible, and the so-called Crane farm was set aside to the horticultural department for its future plantings. In the spring of 1911 a new vineyard was started, and additions were made a year later. It is expected that the old one on the east hill will be removed when the new one comes into bearing. This can probaby be done at the end of next season. New plantings of bush fruits were made at the same time. A new peach orchard of 260 trees was planted the same season at the east end of the Rosebrook lot, the old plantings have been nearly all removed. This orchard now promises to furnish some fruit next year. All of the earlier plantings of apple orchards are now bearing, so many of the scattered trees around the fields, as on the campus, are being removed, and the labor of caring for the orchards is made more convenient.

A portion of the summer of 1911 was devoted to the grading of the site of the barn removed from the campus, and in building a new entrance and drive to the cottages built in 1910 and grading around them, and in laying about 100 rods of cement walks connecting the buildings and new dining hall. The buildings now being erected will call for a large amount of such improvements the coming season.

As in previous years many exhibits of the products of the departments have been made at various fair and exhibitions. In some cases the displays were very extensive. Owing to the very perishable nature of much of these exhibits a large share had to be renewed with each display. This necessitates the use of much time and material to make the exhibits. Yet it is very doubtful if the same amount of time or expense would advertise the college to the same extent in any other way. The interest excited and the questions asked, particularly by those who do not often hear of the college in any other way, can only be appreciated by those who have the exhibits in charge and have the questions to answer. It is hardly necessary to add that capable attendants should always accompany the exhibits. In this same connection the department has sent samples of its fruits to colleges and stations in at least six other states during the past year for student study and comparison. The college variety orchard is becoming known and its value recognized beyond the limits of the state.

The department is under great obligation to Mr. John Russ, gardener for Rev. Francis Goodwin of Hartford, for a very large collection of herbaceous perennial plants donated to it the past fall. It embraces about 100 varieties, many very rare and valuable. It is the most extensive gift of plants ever made to the institution. The beauty of this splendid lot may be seen a year later in the border planted on the old barn site.

The important needs of the department are: first, more suitable land for garden purposes. The setting aside of the Crane farm increased our area, but the recent new buildings and athletic field occupy all the most desirable for garden crops, that still left unoccupied being too rocky to be available for garden planting. If the department is to supply home demand for vegetables, more desirable land must be provided. Second, a packing and cold storage house for fruit. No suitable packing house has ever been available, and but a small amount of cold storage space. With the crops now annually harvested much waste results. Nor can we provide room for the students requiring practice along this line of horticultural work. Estimates of the cost of a suitable building will be submitted in time to be presented to the incoming legislature. Third, the increased length and much increased use of the drives on the campus is making it almost impossible to supply gravel or other material to keep them in good condition. Some means of obtaining a supply of crushed stone is much needed. As the town of Mansfield will soon own a stone crushing plant, no doubt some deal could be made, either to buy the crushed stone or rent the crusher and make a supply on the college grounds. All the older stone drives must be redressed and covered very soon.

Respectfully submitted,

A. G. GULLEY

Mathematics, Physics, Agricultural Engineering

The subjects in which I am giving instruction are mathematics, physics, and agricultural engineering; and so much as can be said regarding each, in a brief report, follows.

MATHEMATICS—With the change in the courses of study offered to students there has been a change in the mathematical subjects taught. Two years of our former course were discontinued, and algebra and plane geometry with them. The mathematics now consists of a one year's course in the college, a one term's course in the School of Agriculture, and a two years' course in the School of Mechanic Arts, the first year being the same as that in the college.

The college course in mathematics runs four hours a week through the year. In the fall term advanced algebra is taught from Hawkes' text-book and is supplemented by work in the mathematics of variation and correlation. This year we are especially fortunate in having a series of measurements of the S. C. White Leghorn hens, 150 in number, entered in the First International Egg Laying Contest, to work upon. There are a score of physical measurements of each bird, including several points which are commonly thought to be related to egg production. In the winter term solid geometry is studied, and in the spring term trigonometry.

The School of Agriculture studies "Agricultural Arithmetic," a book of 77 pages which I had printed early in 1912, and in one term of five hours a week has considerable drill in practical farm computations.

The studies in the second year of the School of Mechanic Arts course are geometry review, conic sections, and spherical trigonometry.

Physics in the new college course is being taught this year by me, and the work consists of three recitation hours and two laboratory hours each week. Hoadley's "Elements of Physics" is the text-book used, and it can be thoroughly mastered. The book is rather elementary for a college course; but it is better, I think, to start with too easy than too hard material, because of the discouragement that members of a class feel when they cannot comprehend, and vice versa the encouragement and interest when they can master, the text. The aim in physics teaching may be 1, preparation for research work; 2, mental training; or 3, information. To accomplish the first object there should be a good equipment of instruments of precision, so that precise scientific measurements could be made. Our laboratory is a temporary affair, the equipment is meagre, and precise measurements are almost impossible. The aims of our course are then partly mental training and partly information. The course ought to, and does, increase the student's understanding of the things which he sees about him and so makes him a more intelligent man; and it imparts to him a considerable fund of information regarding things with which he will have to deal on the farm. For example, he will learn in regard to wire, how it is tempered, how it is annealed, what the wire gauge is, what the sizes are. These are points of practical value to him, and so in a hundred ways the course will be informational.

AGRICULTURAL ENGINEERING is the subject to which I would invite particular attention. This branch of instruction in our land grant colleges is receiving wide recognition. Forty-five out of forty-eight of these institutions are offering work in this branch, and most of these colleges have a good equipment in buildings and apparatus for doing the work efficiently. I will mention two colleges in this connection which have good equipment though not the most expensive. The agricultural engineering building of the University of Wisconsin is a two-story-and-basement building of brick and was erected recently at a cost of $40,000, exclusive of equipment. This building contains two lecture rooms, with arc light lanterns, wash room, cement laboratory, drawing rooms, farm machinery room, elevator for farm machinery, tool room, instrument room for surveying instruments, blue print room, and office. Here I spent six weeks of my summer vacation in 1912. At Ames, Iowa, the agricultural engineering building is a structure which cost about $60,000 and contains farm machinery valued at $20,000. In this building are studied drainage, irrigation, farm machinery, farm motors, farm structures, farm sanitation, roads, and allied subjects. I visited this plant in the summer of 1910. A building similar to either of the two just mentioned and equipped for our needs would cost about $50,000. This improvement would give facilities for instruction and research that would be of great advantage to this branch of agriculture.

Respectfully submitted,
CHARLES A. WHEELER

Library

The two years that have passed since my last report have been, for the library, the most progressive since my connection with the college. In the fall of 1911 we moved into the space left vacant by the boarding department. The whole south wing of the main building was thus given over for the use of the library. Partitions were taken down, ceilings and walls were renovated, new stacks were built, and uniform chairs and tables were provided. The result is most satisfactory. For the first time we have room to place our books according to system, and we still have some space left for expansion. The reading room is ample for the present, light, sunny, and airy. That the students appreciate the change is evident from their increased numbers at the reading tables. Better service can be given all around, to students, faculty, and visitors.

The additions of two years have crowded the stacks somewhat, and new ones must shortly be built. This will encroach upon our delightful reading room and may perhaps serve to remind the trustees that great as the improvement is, and pleasant as the library is now, in the natural order of events it can be but temporary. A living library is a growing one, and at the present rate of increase we shall in a few years again be crowded. Our collection of books is growing increasingly valuable, and for their adequate preservation a separate, fireproof building will sometime be necessary.

It would be a great aid to the librarian in book-buying, if a certain definite sum of money could be apportioned each year for books alone. This could in turn be apportioned among various departments, and the library could be built up more systematically.

We have accessioned from December 1, 1910 to December 1, 1912, 749 volumes. This does not include, with the exception of those of the Department of Agriculture, the government publications which, since we have become a public depository, amount to several hundred volumes every year. We have now 12,440 volumes recorded in our accession book.

Respectfully submitted,

EDWINA WHITNEY

English, Economics, Student Records

As a matter of record it is noted that the course formerly known as English 2 was discontinued at the end of the last college year with the remainder of the academic work. The course now known as English 1' is for freshmen who are not high-school graduates and who consequently are not candidates for a degree. No work in English is offered to the freshmen who enter as high-school graduates, an unusual arrangement of the freshman curriculum and one, I submit, that should be altered when the new college course is being worked out.

It is a relief to the makers of course schedules and daily programs to know that they are nearly through the period of transition which has required formulating new courses frequently, putting them into effect a year at a time as old courses have gradually expired, and making new daily programs each year to meet the shifting requirements. One incident of these changes has been that some subjects have been moved into later years of the courses and have been suspended for a year or two until students have caught up to them in the new schedules. A result of the lengthening of the course from two to three and again from three to four years is the omission of commencement twice in a quadrennium.

During the present year the work in elementary economics will be confined to the winter term, with one course for college seniors and one for students in the School of Agriculture. Next year the subject appears in the new junior schedule and runs through three terms. The restoration of the time formerly devoted to economics is welcome, and it accords with the recommendations of the committee on instruction in agriculture of the Association of American Agricultural Colleges and Experiment Stations to the convention of 1911:

"Furthermore, a whole-hearted attempt should be made to develop this important branch of agricultural study [rural economics] in all our agricultural colleges. At least one man in each institution should devote his time to economic problems relating to agriculture * * * *. Your committee is deeply impressed with the importance of developing strong courses in rural economics and sociology and the other subjects just referred to. These all involve the human element in agriculture and country life. They tend to raise the college courses in agriculture above the materialistic plane, to emphasize broadly the human interest that properly inheres in agricultural studies, and thus to inspire both faculties and students in our agricultural colleges with a higher sense of the wide responsibilities attaching to leadership in agricultural affairs. Pedagogically they serve to show that agriculture when broadly treated is to be enrolled among the humanities, as well as the sciences, and ethically they point out the vital connection between agricultural science and the welfare of rural people and even of all mankind."

The new plan of dealing with absences from college exercises under a "cut" system, with penalties for excessive absence, appears to be working satifactorily. At least it has to commend it that absences are now matters of public record, and that there is uniform treatment of them as compared with the former variation of practice among instructors. Without doubt the number of absences has decreased. A student may take his allowance of cuts without explanation, but for further absence he must present a doctor's certificate or other evidence that the cut was necessary.

A subject offered for consideration is the desirability of establishing a system of honors and prizes for good scholarship. At present we have practically nothing of this sort, yet there seems to be no objection to giving official recognition and honor to those who have done meritorious work. One advantage of college life, by common assent, is the opportunity it gives a youth to measure himself against his fellows in keen but fair competition, thus proving his strength and discovering his weaknesses. For encouraging him to make a test of his intellectual powers, the bestowal of honors for excellence in his college work looks highly desirable. Such incentives would only foreshadow the rewards of later years, which the student is constantly assured are to be gained in general upon terms of the sustained application of disciplined faculties. Besides, the incidental activities of student life, like athletics, are so attractive to the normal youth, and they bring such dictinction to those who excel in them, that the counterpoise of a system of rewards and honors for the faithful performance of intellectual tasks seems to be called for, and to be as legitimate as it is necessary.

In the report of four years ago the average charges made to seventy-two students for the preceding college year were given as $177.73. For the college year 1911-12 the average charges made against the same number of students, whose accounts were taken at random from the ledger, were $205.70, exclusive of registration and tuition fees. College expenses have been going up through the country with the mounting costs of goods and services, but no startling increase in the average cost of board, books, etc., appears in the figures just given. The largest amount charged any student during the last year was $323.56. The lowest amount was $159.20.

There are presented below the usual statistics. Perhaps the most noticeable tendency that they show is an increasing preponderance of students from non-agricultural families. The significance of this may be interpreted variously, but one indication that it is not due altogether to the lengthening of the college course is the fact that in the schools of agriculture and home economics the same tendency is evidenced. No chagrin need be felt at this situation when it is remembered that only about one-tenth of the population of the state is engaged in agriculture, and that the interest of the urban population in rural affairs and opportunities has been greatly stimulated in recent years. However, it does raise the question of what foundation of agricultural experience should be required of students who apply for instruction in the principles of agriculture, or how far the college can fairly be expected to go in the way of remedying a deficiency of experience in ordinary farm affairs by providing what is commonly called "practical" instruction.

Respectfully submitted,
EDWIN O. SMITH

	1908	1910	1912
Enrolment to November 30	155	165	205
Old students	67	87	122
New students	88	78	83
From Tolland County	27	21	17
From Fairfield County	25	17	17
From New Haven County	19	20	43
From Hartford County	16	14	31
From Litchfield County	13	16	12
From Middlesex County	9	12	6
From New London County	5	10	18
From Windham County	4	4	6
From other states	32	46	54
From other countries	5	5	1
Male students	127	141	185
Female students	28	24	20
Students living at home	20	19	14
Boarding students	135	146	191
Agricultural students	108	128	182
Mechanic arts students	17	11	6
Home economics students	27	23	13
Not classified	3	3	4

First year	*42	*19	*37
Second year	*19	*14	*24
Third year	*46	*80	*55
Fourth year	*36	*29	*41
Fifth year	3	*17	*42
Sixth year	1	3	*2
Not classified	8	3	4
Under 16 years	20	7	6
Between 16 and 17	22	12	20
Between 17 and 18	18	24	28
Between 18 and 19	25	35	38
Between 19 and 20	16	19	40
Between 20 and 21	17	23	31
Between 21 and 22	15	15	15
Between 22 and 23	8	10	10
Between 23 and 24	6	8	7
Between 24 and 25	1	8	1
Over 25	7	4	9
Father's occupation:			
Agricultural	68	67	83
Not agricultural	70	78	120
Deceased, or occupation not ascertained.	17	20	2

*In 1908 and 1910 those termed first-year and second-year students were in the academic course; in 1912 they are the students in the schools of agriculture and home economics, the academic course having been abandoned. In 1908 the third-year and fourth-year students were in the two-year college course; in 1910 they were in a three-year course, with the fifth-year students doing postgraduate work. In 1912 third-year and four-year students are freshmen and sophomores in the new four-year course, fifth-year students are seniors in the old three-year course, and sixth-year students are postgraduates of the same course.

Farm, Animal Husbandry, and Horse Barn

The two years covered by this report mark progress in the farm department. There has been a decided increase in the routine work, which includes the teaming for the several departments of the college and experiment station. The usual crops have been grown on the farm with more attention paid to the growing of legumes. Six acres of alfalfa has been started and promises well. About ten acres of land has been cleared, fenced and placed under cultivation to make up in part for the loss of the Snow farm and other land now in use by other departments and the experiment station. Four acres north of the college pond has been partially drained, and a start has been made to clear away and bury the stone. Considerable road has been built and improved. The field surrounding the dining hall has been cleared, graded, and seeded, also the grounds around the church shed have been improved. The grounds surrounding the new horse barn have been cleared, drained, graded, and seeded. Drives and approaches have been built and underlaid with rocks and stones. Quite an advance has been made in the amount of brush cut in the pastures, and also more than usual progress has been made in the improvement of the permanent fences. During the past season the farm horse barn has been moved to a new location, the surrounding land partially cleared, the site filled with stone and graded. Loans have been made to the department of Aspinwall and Boss potato diggers, Fairbanks Bull Dog and Detroit gas engines, Syracuse and Oliver sulky plows. We also have the promise of a Holt caterpillar traction engine.

The needs of the department at this time are: An appropriate and adequate building for the storage of our working and exhibition machinery, with provision made for repair and class work. Funds for the improvement of land and for fencing. An ice house. This would probably necessitate the construction of a dam. Scales should be provided at a point where our crops of corn and hay would be weighed as they are harvested, making it possible to keep an accurate account of them.

In the horse barn department, the most important event to be reported is the moving of the barn. This required the moving of the whole equipment to a temporary location and later back into the barn. A new stable of modern design has been started. This will accommodate all the horses in use on the farm and in the transportation service. The stone building which was built for a piggery may be pressed into service for the accommodation of brood mares and colts. The routine work of handling passengers and express to and from Eagleville has been handled as well as possible under the existing conditions. This work is constantly increasing, and with the road to Eagleville in its present condition the tax on the teams is heavy. The work has been accomplished with the horses of the barn, which include some breeding stock. No horses have been purchased during the past two years, although one has been lost by an accident in peddling milk, two by old age, and one has been traded in toward a team for the horticultural department. Very little has been expended in new equipment, three exchanges of vehicles only having been made. The others have been repaired. Considering these facts and the demand upon it, our equipment is in fairly good condition. A second-hand 1,500-pound Buick truck has been put into use during the latter part of this year, and its use would indicate that this would be a desirable way to handle much of our work.

The principal needs of this department, in addition to those now being met, are funds for the purchase of an auto bus and other needed equipment.

An attempt has been made to improve the course in animal husbandry each year. One of the older farm teams was sold and replaced by a very good pair of registered black Percheron mares. The loan of the stallion from the Gilbert farm for a part of each season has also been a help. Dr. H. S. Neilson of Darien very generously donated to the college his imported Shropshire ram and five head of ewes and lambs. The addition and careful selection of the best in the flock each year has resulted in giving us a flock that was easily the best one at the Connecticut fairs during the past season. A car load of grade heifers was purchased through a commission house at Chicago two years ago. These have been culled, keeping the best, which with their calves have given us a start in beef cattle. In addition to this a pure bred Aberdeen Angus bull and a pair of pure bred Herefords have been placed in the herd. An outbreak of what was feared to be cholera among the hogs temporarily checked the development of this branch of the department. The loss was not heavy, however, and a new herd has been started on another section of the place.

The plan of making a diversified college exhibit at some of the leading fairs has been continued, and for this purpose a 40 x 80 tent was purchased. This has proved an attractive and instructive feature, which the public seems to appreciate. Considerable work in judging and an increased amount of institute work have also been accomplished.

In this department funds are needed for the purchase of more pure bred horses of draft type; in fact I recommend that our teams be maintained by the addition of such animals. This should prove in the end an economical proposition, at the same time furnishing us with material for class work and providing an object lesson in the production of a class of horses that are continually increasing in demand, in spite of the advent of motor vehicles. We should also improve our beef herd, provide sheds for feeding steers and sheep in addition to properly fitting up the barn. I would recommend that a cement silo be constructed for the more economical feeding of this stock. This could be made instructive in connection with class work along this line. It is also essential that stock scales be provided, so that all the live stock may be weighed frequently and careful records kept.

Respectfully submitted,
H. L. GARRIGUS

Agronomy and Experiment Station

During the past year the work of the department of agronomy has been carried out according to the schedules outlined in the college catalogue. I have been assisted in this work by Mr. H. J. Bower, who was appointed assistant in agronomy. He has done especially good work in giving instruction in the School of Agriculture.

The last legislature made an appropriation for a new laboratory in which the work of soil physics and farm crops will be cared for, and this will greatly improve the facilities for instruction in the work of argronomy. The classes have become so large that I have found increasing difficulty in properly handling the practical field work. Classes of not more than ten at a time should be arranged if the field work is to be given as it should be given. But it has been impossible to provide for these small divisions, and I can see no possibility of arranging for them in the future.

A serious need of the department is land on which students may practise with the various farm implements and with the growth of crops. The entire separation of farm work from the instruction in agronomy is not conducive to best results so far as instruction in agronomy is concerned. If at least ten acres could be set aside as a laboratory field in which students could practise with the plows and the various farm implements, in which they could plant crops and care for them, it would be a wonderful addition to the equipment of the department. Where the regular farm crops are being grown it is not best for students to attempt to do the work, but they should have a place where they can do the work, where they can get actual field practice in which large numbers of the students are deficient when they graduate from here. There should be available at all times teams and farm implements for students' use. The increasing amount of team work which is called for in the growth of the college has interfered somewhat at times with the practise work of students. It should not be permitted to do so. I would strongly recommend that before students be permitted to graduate they should be required to have at least two summers of actual, practical work on farms.

The work in the experiment station during the past year has proceeded along the lines of previous years. No new departments have been created, and no new problems for investigation have been taken up. The most important problems under investigation at present are with reference to the bacilliary white diarrhea of chicks, the incubation of eggs, management of a dairy herd, soil bacteriology, and soft cheese investigations in co-operation with the dairy division of the U. S. department of agriculture. The field which is being prepared for experimental work in the department of agronomy is being underdrained, and at least another year will be required in order to put this field in condition to begin experiments. It should be plowed to a depth of at least nine inches, and every stone or boulder within that area should be removed. This field is then going to offer one of the very best opportunties for field plat experiment work. The department of agriculture does not have proper facilities at the present time under which to conduct experiments. Permanent land should be set aside which can be available for experimental work in gardening and orcharding.

A serious handicap of the experiment station has been the increasing demand upon the time of men for teaching work. This has been due to the increase in the number of college students and particularly due to the new courses which have been established in the college. During the past year men who were expected to be in experiment station work at least one-quarter of the time have been spending twenty-one hours a week in the class-room. No man can do experiment station work and be so loaded down with class work. While I do not consider the entire separation of college and station work a good proposition, yet there should be an understanding as to the number of hours of teaching per week for each man, and then under no conditions should the amount of class-room work be increased for these men. Experiments have been carried on and data have been secured, but the men have not the time to write up the results. I can see no valuable work accomplished by the mere accumulating of material unless the men have time to prepare this material for publication.

Respectfully submitted,

L. A. CLINTON

Entomology and Zoology

During the past year I have felt a great satisfaction in the results from the rearrangement of courses. In the past general and special subjects have found their place early in the courses of the students. The present system of placing botany, chemistry, mathematics, and zoology early in the course has given a more logical arrangement in that the students get foundations from these courses which aid them greatly in the work of the more specialized agricultural subjects that follow.

The plea that the student should not be a year at an agricultural college without having studied a special agricultural subject means but a curtailing of training for so important subjects, and in the end tends more to obscure than to clarify the whole course.

With the rise in requirements for entrance there has been an advance in scholarship. Students come to us with some drill in the elements of science. For this reason better and more comprehensive work has been done by the freshman class as a whole, than with any previous first year's class. With the increased capacity for work better facilities for teaching are necessary. The installation of electricity has given the opportunity for illustrated lectures for the classroom, which in turn give the students the opportunity of seeing as well as hearing about the objects studied.

While the laboratory is overcrowded in order to seat the students at the tables, the general equipment is entirely satisfactory.

I feel, then, that rapid progress has been made during the past two years on account of the better preliminary training of our students, the rearrangement of courses, and the better facilities we have had for doing work.

Respectfully submitted,
GEORGE H. LAMSON, Jr.

Mechanic Arts

Since my last report the course in this department has been changed from a three-year course in mechanic arts to a two-year school of mechanic arts.

MECHANICAL DRAWING—Tracy's text-book is used, as in former years, for beginners, followed by tracing, blue printing, sketching, machine drawing and design.

The courses in shop work now taught consist of wood turning, pattern making, machine work and forging. A special course in hand joinery has been omitted, but is taught in connection with wood turning and pattern making.

WOOD TURNING—This course consists of the study of the lathe and use of the different tools, turning stock between centers, on the face plate and in chuck, finishing and polishing in lathe while in motion.

PATTERN MAKING—Various patterns are made to illustrate draft, shrinkage, finish, cores, fillets, etc., and the course is concluded by a lecture on moulding and casting, in lead, from some of the patterns made.

MACHINE WORK—The stock for the beginners' exercises is cast from the patterns made in the previous course. By this means the student may discover any mistake that he has made in the patterns and is taught the wonderful adaptability of the engine lathe for almost any job.

The preceding class designed a three horsepower gasoline engine, made the patterns, and partly machined the castings. The present class will complete the work and assemble the engine.

Better and lighter accommodations for shop work are needed, and the department is looking forward to the time when a new dining hall will be erected and the present temporary one be liberated for mechanical purposes.

FORGING—With the large classes from the school of agriculture coming to this department for instruction in forging, in addition to the regular mechanical students, better accommodations and more equipment seem imperative.

Forging is now taught in a rented building, one-third of a mile from the other class rooms. This building, equipped for eleven students, is inconvenient, poorly lighted, badly ventilated, and being of wooden construction, is unsafe for forging purposes. Nine of the eleven forges, having seen fifteen years of use, are constantly in need of repairs and attention, thus interfering with class work. Under the existing conditions the department feels justified at this time in asking that the erection and equipping of a new forging shop be considered in the very near future. A shop conveniently located and practically fireproof, to accommodate twenty-four students at one time and equipped with modern down draft forges, could be built at a cost not to exceed ten thousand dollars.

FARM MECHANICS—This subject was introduced in the new courses and is taught jointly by Mr. Garrigus and this department. Lecture hours are used in bringing to the attention of the students many of the mechanical problems that the progressive farmer of today must face. Laboratory hours are used in working out the problems and demonstrating various machines and appliances. The following subjects have been discussed this year: steam boilers, steam and gasoline engines, power transmission, belts, ropes, shafting, gears, chains, iron pipe and fittings, lead pipe, soldering, rope splicing and knots, pumps, windmills, rams, bolts, nails, screws, strength of materials, lumber, and farm machinery.

A lack of apparatus, machinery, and appliances for demonstrating purposes was evident from the start, and a building for the housing and exhibition of such would very much facilitate the teaching of this subject.

The care of the fire apparatus is under the superintendence of this department, and a volunteer fire company has been organized among the students.

The care and repair of buildings, water supply outfit, heating apparatus and the teaching of agricultural drawing and wood work has been under the able control of Mr. Blake since the fall of 1911.

Respectfully submitted,

J. N. FITTS

Meteorology and Bacteriology

There is each year an increase in the number of students and interest in the subjects taught. The plan of the work is to make these courses practical in every way.

METEOROLOGY—Only so much of the technical part is given as will make the practical application to agriculture understood. Climate and crops form a strong feature in the course. The relation of temperature to the sprouting of seeds determines the time a crop should be planted. 'The temperature for the sprouting of oats and potatoes determines they can be planted to advantage the last of April. The temperature for the sprouting of corn shows it should be planted from the twentieth to the twenty-fifth of May on normal years. A study of the frost line for twenty-three years in this locality indicates the time when danger from frost is past in May, and the time in September it is likely to appear.

BACTERIOLOGY—There are three courses outlined in the present catalogue. One in general bacteriology is required of all students. The other two courses are elective. One is in dairy bacteriology and the other in soil bacteriology, each having two hours of lecture and four hours of laboratory work a week for the entire year. Which elective will be given in any year is determined by the choice of those electing it.

General bacteriology is taught in three subdivisions; soil bacteriology, dairy bacteriology, and hygiene bacteriology. This includes two lectures and two hours of laboratory work a week for two terms. The room for laboratory work was so small that the class had to be divided into five sections, and each section obtained only one-third of the time alloted for the laboratory work. There is an urgent demand from the students for more time and opportunity to do practical work. This request can be granted when the addition to Agricultural Hall is completed.

The most emphasis is being placed on soil bacteria in their relation to soil fertility, a subject of greatest moment today; and second, the relation of bacteria to the individual and to public health.

The needs of the department in meteorology are: a weather shelter for holding important weather instruments, a barograph, a thermograph, an automatic rain gauge, a sunshine recorder, etc., also a few minor instruments for class room demonstration. In bacteriology there is needed an equipment of desks and apparatus for sixty students when the new laboratory is ready for use in the dairy building.

Respectfully submitted,

W. M. ESTEN

Dairy Husbandry

The work of the dairy department is divided under two general heads: (1) the work of dairy manufactures and (2) the work with the dairy herd.

Dairy manufactures includes the handling of milk and its products in the creamery. Instruction is given in proper methods of cooling, aerating, bottling, and separating milk; in the cooling, ripening and churning of cream; in the manufacture and handling of butter by both dairy and creamery methods. A limited number of cheddar cheese are made each year, and some instruction is given in the methods of making a few soft cheeses.

Instruction is also given in the history and present status of the ice cream trade, and in manufacture, packing, sale, and delivery of ice cream and related products.

Under this heading is also given instruction in testing milk for specific gravity, butterfat, total solids, acidity, adulteration, and preservatives; the handling of milk for immediate consumption, and the requirements of state and city boards of health in regard to sanitary conditions of barn and creameries.

On the side of production, a study is made of all the factors pertaining to the breeding and handling of a dairy herd. The herd consists at the present time, November 26, 1912, of 54 head. Of these 27 are mature cows, 6 are bulls, and the remainder (21) are young heifers from 2 years old down to 6 months.

A careful study of the cost of milk production is made each year, and this information is used in the class room, furnishing excellent material to use in the discussion of the economics of the dairy business.

NEEDS OF THE DEPARTMENT—The size of the herd should be increased in order to furnish a larger proportion of the dairy products used in the dining room of the college. In order to do this, some money should be appropriated to buy a few more pure bred cows, especially Ayrshires and Guernseys that would also prove valuable for teaching purposes. It would also seem to be a good policy to invest a larger amount of money in bulls of extra value as breeders and as specimens of their respective breeds.

The provisions for taking care of these cattle are inadequate. Even with the new barn being built, the proper amount of sanitary space will not be available for housing young stock and bulls. It is important that both these classes of animals should be kept in stables and yards that will permit them to have good light and some exercise. A further appropriation of money for this purpose is needed at once.

Respectfully submittel,
J. M. TRUEMAN

Botany and Summer School

With the rearrangement of the curriculum, the courses in the botanical department in the college have included a larger amount of laboratory work. The students in consequence have had a better opportunity to acquire habits of accurate observation and correct reasoning, which form the most important product of laboratory work. In the new School of Agriculture, the shortness of time allowed to botany has necessitated confining the work to a consideration of only the most fundamental functions of plant life and of the forms and structures that constitute the subject matter of the applied courses.

The material equipment of the department has not been greatly changed. The agricultural botanic garden has been enlarged, but has continued to serve as a valuable adjunct both as a source of supply for class and laboratory material and also as a museum of living plants for field study.

A tree survey has been made of the college campus, and a planting plan has been approved by the trustees which includes all the native trees of the northeastern United States as well as the most valuable exotics. When these plans shall have been carried out, the college should have in an arboretum on its own grounds a collection of trees second to that of no other college in the country. In connection with work on a recent bulletin "New England Trees in Winter," the department has started in the museum an exhibition collection of tree specimens. As suggested in previous reports, greenhouse facilities are needed by the botanical department for instruction purposes.

The summer school for the past two years has been little altered as regards the character of the courses offered. Courses have been added, however, in sanitary milk testing and in rural economics. The attendance naturally has not been so large as three years ago when the Willimantic Normal School held its session with us at Storrs. At that time we were able to make our courses available to a larger number of teachers. It is hoped that some arrangement may be possible whereby our peculiar advantage for summer work, especially agricultural instruction, may be of greater service to the teachers of the State.

Respectfully submitted,

A. F. BLAKESLEE

Chemistry and Physics

At present this department offers three full year courses in the study of chemistry to the college students: a first year course which is required of all freshmen; a second year course which is required of all students who have had a year of high school physics, optional to juniors and seniors; and a third year course which is optional to seniors who have previously had the first and second year work. One year's work is also required of the students in the School of Agriculture.

The work of the first year college course as now presented consists of a thorough study, both in lecture room and laboratory, of some of the fundamental principles and conceptions of the science together with an extended description of the more common elements. With the ever increasing mental efficiency of each succeeding entrance class has come a higher grade of work accomplished. It is hoped that within a short time the kind and amount of work done in this course may rise to standard college grade. In making this course one of pure science the department has consciously left out the somewhat too prevalent infusion of "related applications," leaving these "applications" to be dealt with in each of the several departments devoted to their course. It is believed that to send a student from the first year course with a clear understanding of the fundamentals of the science and a more scientific method of thinking, thus increasing his capacity to cope with problems which involve a knowledge of the subject, should be the true aim and object of the course.

The second year course is at present devoted to work in qualitative analysis. The object of this course is to develop in the student such skill in the technique of the subject as will enable him to determine in the qualitative way the inorganic consituents of waters, soils, fertilizers, and foodstuffs. Fifteen students are now taking the work of this course, this number utilizing the full capacity of the small laboratory on the second floor of the building. With a larger number of students in the course next year this laboratory will be too small, and after the introduction of the course in quantitative analysis in 1914 the work of this course must be given in the main laboratory alongside of the first year classes in the college and the School of Agriculture. This use of one laboratory by three classes in as many different courses is not desirable, but for lack of room the solution seems the only one possible.

The third year course will not be given until the fall of 1914. This course will be given to seniors who wish to pursue work in agricultural chemistry and agricultural chemical analysis.

Besides the above mentioned work in the college the department requires one term of physics and two terms of chemistry of the students in the School of Agriculture. The course in college physics recently taught by me is now taught by the head of the mathematical department.

For the increase in the number of courses and larger classes new and larger amounts of apparatus have been needed. This apparatus together with a more complete equipment for lecture table demonstration and general use is being constantly obtained, so that the student now taking chemistry has everything needful for successful manipulation. The only department need at present is more room. Although relief has been given by the increased number of lockers recently installed in the main laboratory, this relief is only of a temporary nature, and in another year the over-crowded condition which was spoken of in the last department report will be more discouraging than ever. In brief, we have outgrown our quarters. This need for more room, and it is a most urgent need, can only be satisfied by the occupation of quarters in a new scientific building, or what would in the end be the only satisfactory solution, the occupation of a new and more commodious chemical laboratory building.

Respectfully submitted,
HOWARD D. NEWTON

Military Science

During the two years ended November 30, 1912, the military instruction has followed as closely as possible the course prescribed by the war department. The encampment required when practicable was held for the first time at Fort H. G. Wright, N. Y., from May 4 to May 11, 1912, and enabled the cadets to obtain a much clearer idea of field service duties than they had been able to get heretofore. As a result of the encampment the cadets passed the annual war department inspection very creditably and were able to carry out all the exercises called for by the inspector. As a means of creating interest in the military work and of improving the military department generally the encampment is an excellent thing. The cadets enjoyed their week in camp and no doubt look upon it as time well spent. They made a good impression upon all who saw them and were particularly praised for their good conduct. There was no serious sickness. An army surgeon visited the camp daily and saw those who needed attention. The food was plain but well cooked and was sufficient in quality and quantity.

We were handicapped by not having proper camp equipage. At the time the encampment was proposed it was thought that it would be an easy matter to obtain tents, cots, and cooking outfits. None could be obtained from the war department or from the state national guard. Two large show tents were used, but were not satisfactory. The military department should be equipped with its own camp equipage. This property could be purchased for about $2,000.

The idea of an encampment should be encouraged. In the future several colleges might combine in one encampment. Military, athletic, and other contests could be arranged. The students during the year would have a greater incentive to work, and pride in their college would greatly increase. It is thought that a combined encampment would result in much good to the student and to the college.

Space for drill and exercise during the winter is greatly needed, also for storing equipment. The increase in the number of students makes this want keenly felt. A building to be used as a gymnasium, armory and recreation hall should be erected. The students suffer physically during the winter from lack of exercise. With such a building daily exercise for at least thirty minutes should be required of all students during the winter term.

Respectfully submitted,

J. M. CHURCHILL,

First Lieutenant U. S. Infantry

Home Economics

The following report of the home economics department of the college may be divided into two parts: 1st, the fitness of the present courses offered; 2nd, the future outlook and needs of the department.

First. Judging from a year's trial, the new course offered in the School of Home Economics in 1911 has appealed to a slightly different class of girls from that for which it was planned. The girl from the the small city or town, instead of the girl from the farm, has taken advantage of the education which this state institution offers to her. Whether this is fortunate or not remains to be seen. Certainly the fact has modified the course to some degree as far as the teaching is concerned. Another fact influencing the teaching is the different degree of preparation which the students show.

With but one or two exceptions in the two years every student has had from one to four years high school work before entering the School of Home Economics. This makes it difficult to plan the work so that it will be hard enough for the high school graduate and easy enough for the girl with but one year's secondary training behind her. Variation in age from fourteen to twenty-two also complicates the situation to some extent.

As far as the vocational or home economics subjects are concerned it has been possible to adapt the work in general to the need of the pupils with fairly good success. It has been impossible on account of the small number of girls and the demands upon other departments of the college to have the work in physics and chemistry emphasize the phases of these sciences which are directly in line with household science. We lack a course in biology to amplify and interpret the simple physiology given. We need a strong course in drawing and design to prepare girls to appreciate the fine things in life and to improve standards of taste in personal and household belongings. On the other hand we are fortunate in having a course in household bacteriology and one in horticulture especially planned for our students.

After the first class graduates from the two years' course, it may be possible in 1913 to judge what modifications are necessary to make the School of Home Economics as strong and thorough as possible.

Second. It is easy to call "ideals" "needs," and perhaps the "needs" here stated are really "ideals" and incapable of immediate realization. It is to be hoped at least that they are not unreasonable.

1. We need to have the present dormitory reserved for students and students alone. Much of the friction seemingly impossible to avert is due to the mingling at close quarters of students and non-students. This is an important need of the near future.

2. We need extra bathroom facilities on the second floor, or a readjustment of the present accommodations. This could be obtained by using one of the smaller bedrooms in such a manner that baths,

toilets, and wash basins could be entirely separated, thus securing a degree of privacy and common decency which at present is not possible where one small bathroom must serve the needs of twenty people.

3. We need some definite provision for a girls' recreation field on college grounds, where the girl students could participate in outdoor activities with and without the supervision of a physical training teacher. As long as there is no gymnasium work with apparatus, etc., it would seem that the gymnasium might be used as a club room for the girls. This would provide a much needed place for indoor recreations, club meetings, etc., which are now confined to the parlor on the lower floor.

With the higher standards for entrance into the college which another year is likely to see, it does not seem premature to think of the present four years' college course as one which with certain modifications may prove attractive to the girls of the state who wish a college education. Cornell, with its many great advantages, offers a fine course to women, one which in a simple way could be carried out in Connecticut provided the teaching force in our Home Economics department was strengthened. At present it is the only department in the college where during the fall term, nine separate courses are given, making a total of twenty-three classes or thirty-five hours lecture and laboratory work per week. With so many classes, small though they are, it is hardly possible to prepare for them adequately.

In the four years college course offered to girls there should be provision for professional work of some kind in the home economics field; teaching, institutional or home management, etc. The latter could be admirably taught in co-operation with the dining hall department of the college, which offers a fine experience in catering, marketing, etc., from the large standpoint of the institution. For the smaller outlook of the home and its needs a model house or apartment is needed where classes could have actual experience in keeping house, putting into practice the more formal work done in laboratory or class room, and making it a vital thing, full of real meaning.

With such a college course to train the Connecticut girl to whom the Woman's College in New London will not appeal because of its classical curriculum, we should be able in a few years to compare our work for the girl student with that high standard of education which the western agricultural colleges offer and maintain for women.

Respectfullly submitted,

MAUD E. HAYES

English and Public Speaking

The English of the School of Agriculture should really be called by some more descriptive name, such as "Use of Correct English." All students having had two years of high school training are excused, but even so the students differ so greatly in the amount of preparation that it is difficult to frame a course to meet the needs of all. It must be a practical course with mostly drill in correcting the everyday speech. Particular stress is laid on spelling, letter-writing, and punctuation.

The course for the second year class of the school is being given for the first time this year and is an attempt to give the student at least a slight acquaintance with the best known literature. It gives a training in sight-reading through the books read in class. Outside reading is also required. The time being limited to two hours a week makes it necessary to condense greatly.

The public speaking in the first year of the School of Agriculture, one hour a week running through the entire year, has to include a great deal. The students speak extemporaneously on current topics and are thus taught to collect their ideas rapidly and express them in a few well chosen words. At other times topics are prepared in advance, and only notes are used. A little class debating is taken up, and the students are always interested in these debates. The class is too large to get the best results from the work.

The public speaking in the sophomore year—two terms, one hour a week—gives the student an opportunity to appear frequently before the class, mostly in original work. This, I believe, gives him greater ease, and later he can interpret more freely the work of the writers. Extemporaneous speaking and the study of the "Principles of Argumentation" paves the way for debating in the junior year course.

The junior year course has not yet been given on account of the change in classes.

Respectfully submitted,

MARY C. ROGERS

Music

During the year just past the music department has been given a studio on the third floor of the main building. This room is large enough to accommodate all the members of the various college musical clubs, and contains a new piano. The deepened interest of the students in the college music as evinced by their regular attendance at all rehearsals and generous gift of unrequired time for special coaching has been most gratifying and strongly expresses their appreciation of the new room.

Opportunity is given to any college student for vocal or piano lessons. The only drawback to effective work by piano pupils is the lack of practice rooms, it being necessary for the young men to use the piano in the college chapel, and the young ladies the piano in the parlor of Grove Cottage.

In the domestic science department a course of sight singing has been introduced, which aims to teach elementary theory and the essentials of good tone production in addition to the sight singing. A girls' glee club will eventually be formed as a result of this course.

The men's glee club has about thirty members. A group of selected men from this club, assisted by a mandolin club of seven men, has given successful concerts in various towns of the state, where the dignified bearing of the men at their concerts and in the homes of the people who entertained them has proved to be a good advertisement for the college.

A college orchestra has been organized which furnishes good music for informal dances and also presents a concert program assisted by a soloist and reader.

The music in the Sunday morning church service is led by a volunteer student choir composed of men from the musical club and young women from the domestic science course.

For the measure of success attained in this department, I wish to express indebtedness, first, to the college for giving us an adequate room; second, to the students who have so heartily co-operated and given freely of their time in the support of all college musical work.

Respectfully submitted,

LILLIAN E. BERRY

Poultry Husbandry

I have the honor to present for your convenience and consideration a report on the progress of the work in the poultry department during the past two years. It seems only fair to say at the outset that the entire personnel of the department has changed within the past seven months, in consequence of which it becomes my privilege to report on work instituted by the former organization.

INSTRUCTION—Courses of instruction to regular students have been given as prescribed by the catalog, and short poultry courses have been offered in connection with the summer school, but the special winter short course has been temporarily abandoned on account of the department's inadequate equipment, and the college's limited dormitory room. In a previous report, my predecessor suggested placing "the work of this department on a par with that of the excellent departments of horticulture and dairy husbandry." In view of the present prospect of much better equipment in the immediate future, it seems fitting at this time to again invite your attention to this suggestion, and to especially recommend its adoption, so far as may be compatible with already established work of other departments. It is believed that such development will enable this department to do larger good, and to at least partially meet the demand for students of greater poultry proficiency.

INVESTIGATION—The experimental work proper has had to do with two problems:

First, cause, treatment, and methods of combatting white diarrhea of young chicks.

Second, an attempt to breed an American size fowl to lay white eggs, instead of brown.

Bulletin 68 of the experiment station comprises a report on the white diarrhea work, and another report is now in course of preparation. The breeding problem, which has been conducted solely on the mass selection idea, has not been reported. Continuation of this work is proposed, and there is contemplated a duplicate experiment, conducted in accordance with the Mendelian theory of inheritance. In addition to the above, the department, in co-operation with the state fish and game commission, has undertaken the artificial propagation of quail and other game birds. The work of the past season has, in some ways, been eminently successful.

EXTENSION—Extension work has consisted of sending speakers to institutes, granges, county fairs, poultry association meetings, and in conducting Y. M. C. A. lecture courses. Furthermore, the department is handling an increasingly heavy correspondence, the major part of which is purely extension work.

EGG LAYING COMPETITION—In the autumn of 1911, the experiment station and the "Philadelphia North American" jointly inaugurated an international egg laying contest, which was conducted on the grounds of the college and under the immediate supervision of the poultry department. For this purpose an entirely new and modern plant was constructed. It consisted of fifty twelve by twelve colony houses, each provided with yards twenty by fifty feet. The experiment station has issued a preliminary press bulletin on the competition, which terminated October 31, 1912. A more comprehensive report is now being prepared. This contest seems to have been of value to the college in that it has brought the institution considerable additional publicity and has afforded an opportunity to collect records that would not otherwise have been obtained. It has, perhaps, accomplished greater good by insistently inviting the poultry public's attention to the productiveness of hens; to pedigrees of performance, rather than of plumage.

NEEDS OF THE DEPARTMENT—The new poultry husbandry building, now in process of construction, will make fairly liberal provision for office, incubator, laboratory and class-room work. When laying competitions do not occupy the entire new plant, it will well provide certain forms of student practice work. But neither the new plant, nor the old, nor both combined, make suitable and adequate provision for brooding, an intimate knowledge of which is essential to every poultryman's success. There seems, therefore, to be urgent need for a modern brooder house.

A great many Connecticut people can devote to poultry only a limited land area, whereas our scheme of development is based only on the colony, or extensive, plan. The department ought to have at least one building that will house several hundred hens, in order to facilitate teaching the largely practiced intensive system. Lastly, if the department is to offer better poultry courses, if it is to augment its extension work, if it is to continue its present investigations which can ill afford to be abandoned, then it becomes necessary to supplement the department's present organization.

MISCELLANEOUS—During the past two years, the experiment station has taken over and is supporting the old plant, so called. All stock is devoted to purely experimental purposes, except a few guineas, pigeons, and water fowl, which are the property of the college. In the event of attempting to maintain two plants, it is thought they should be in closer proximity, especially in view of the exceedingly poor location of the plant now devoted to experimentation.

It may be of interest to mention in this report the fact that at the close of the 1912 summer school the Connecticut Poultry Association extended its annual meeting here to cover three days instead of the usual two.

The following donations have been made to the department since the writer assumed his duties last April:

Buff Orpington Duck Eggs, Geo. F. McPhelemy.
Columbian Wyandotte Eggs, D. Lincoln Orr.
Dry Mash Feeders, Park & Pollard Co.
Dry Mash Hoppers, Peerless Hopper Co.
Incubator Therometers, Chas. Wilder Co.
Lice Proof Perches, J. R. Patterson.
Trap-nests, Caw Law Poultry Farm.
Water Fountains, Norwich Automatic Feeder Co.
White Call Ducks. F. O. Grosbeck Co.
White China Geese, F. O. Groesbeck Co.
White Diarrhea Remedy, Pratt Food Co.
White Diarrhea Remedy, Sanat-Aves Co.

This report would be incomplete without some acknowledgment and some thought of appreciation for the President's co-operation and support.

Respectfully submitted,
W. F. KIRKPATRICK

Orchard Demonstration

As outlined in a former report the work of giving orchard demonstration was started in response to a demand from the fruit-growers represented by the Pomological Society. It was first started in the spring of 1910 when two orchards were selected, one at Cheshire and another at Pomfret. During the spring of the present year a third orchard located at Bethel was selected. These three orchards are permanent demonstrations. Originally they were in a badly neglected condition and were fairly typical of the average farm orchard. The owners agreed to follow the directions of the college representative on either the whole or a part of the orchard. The public was invited to be present while the various operations were performed and to observe the improvement in the condition of the trees. The work has aroused much interest in the respective neighborhoods. Several hundred people have visited the orchards, and many improved apple orchards in their sections are the result. The influence, however, does not extend far enough, and we should have at least one orchard in each county.

While the owners bear the expense in connection with the various operations, the work calls for very close supervision on the part of the college representative. We must make several trips during the season and keep in close communication with the owner of the orchard. As the work develops the more help will be necessary, for on account of the operations coming in all of the orchards at the same time, it is physically impossible for one man to handle more than three or four orchards. It is hoped that the time is not far off when the college may have in each county a representative whose duty it will be to take charge of all demonstration work in the county and to render service along various lines.

Another type of demonstration work that has been carried on during the past two seasons consists in doing one-day demonstrations in pruning and spraying. These are temporary demonstrations, and the college assumes no responsibility for the result of such work. There is one serious fault with this type of work in that the owner may not follow up the work, which if neglected is likely to reflect discredit on the college. The only reason or excuse for conducting such temporary demonstrations is to satisfy the insistent demand from all sections of the state. With the same expenditure of time and money more territory may be covered and more people reached in this way than by the permanent demonstration scheme. One-day demonstrations have been given in the following places:

1911

March 20th, on farm of D. L. Ives, South Windham.
24th, on farm of F. O. Jackson, Middletown .

28th, on farm of P. G. Seeley, Washington.
30th, on farm of H. N. Eaton, Meriden.
30th, on farm of M. Ratner, Colchester.
April 3rd, on farm of G. G. Tillinghast, Vernon.
10th, on farm of W. M. Chandler, Saybrook.
12th, on farm of Mrs. John Bunnell, Fairfield.
14th, on farm of F. M. Hollister, North Stonington.

1912.
March 29th, on farm of Connecticut Agricultural College, Storrs.
April 1st, on farm of Robert C. Keeler, Bethel.
3rd, on farm of S. A. Smith & Son, Cheshire.
5th, on farm of Joseph E. Stoddard, Pomfret.
8th, on farm of Saunder Brothers, Farmington.
10th, on farm of George B. Prest, New London.
12th, on farm of G. S. House, Chapinville.
15th, on farm of F. O. Jackson, Middletown.

There is a demand for information pertaining to the planting and care of young orchards, and therefore in addition to the mature demonstration orchards we should have a series of young demonstration orchards. By keeping an accurate account of the expenditure and revenue of these orchards we would be able to throw some light on the cost of production,

Respectfully submitted,
C. D. JARVIS

Social Committee

The duties of the social committee in 1911-1912 proved themselves to be the formation of a sort of social clearing house where those interests of the students which seemed appropriately related to the committee could be cared for. The committee proved to be a medium in many cases between students and faculty, and it was very careful to act only in co-operation and upon fairly equal terms with the student body.

The work of the year was informally discussed in committee meetings which were held as often as necessary at the call of the chairman, and resolved itself into two divisions—the entertainment section and the section responsible for the winter term Sunday vesper service.

The entertainments given were well patronized and appreciated by both students and faculty. There were five during the three terms.

1. Musicale—Male quartette from Boston.
2. Reading—"She Stoops to Conquer" Miss Edith Noyes
3. Lecture with stereopticon views. Arctic Exploration, Frederick Macmillan
4. Musicale—Colonial quartette and reader from Boston.
5. Lecture with stereopticon views—Wild Animals I Have Known, Ernest Thompson-Seton

Besides the above, for which an admission fee was charged, there was a free lecture upon "Aeroplanes" given by a member of the New York Aero Club, which was well illustrated by stereopticon views.

The vesper services were arranged by a joint committee formed of the members of the social committee and a representative from each student organization. The plan was to alternate musical service with a short address and music, and this seemed to work well.

The college orchestra, members of the faculty and students contributed to the musical services, and upon the other Sundays members of the faculty and as many outside speakers as it was possible to secure gave the short addresses. It is felt that the vesper services prove a valuable help in making the long Sunday afternoons of the winter term of benefit and enjoyment to the student body.

The social committee led the campaign for the observance of "Junior Week," and with the co-operation of representative students it was possible to plan the events of the half-week devoted to the junior class so that they and their guests had a very enjoyable time. A reception by the committee to the junior class and its guests and an open air "sing" on the campus in the evening were the festivities specially in charge of the committee. The other features of the week, the play of the Dramatic Club, the White Duck Hop, athletic events etc., combined to make a gay time and a time when real loyalty to college and class was shown.

The social committee feels that in these informal ways it can be of service to the college in co-operating with all attempts to make the social side of the life of the college function in the best way—that college, not class or society loyalty may be increased among the students and that they may feel that there is a real interest on the part of the faculty in their amusements as well as in their training and education.

Respectfully submitted,
MAUD E. HAYES,
Secretary

Report of Gilbert Farm for Year Ending March 31, 1911

Cash on hand April 1, 1910			**$2,994 15**
Dividend Gilbert & Bennett Mfg. Co.			**10,800 00**
Interest			**90 90**
Farm Receipts—Milk		**$6,406 78**	
Stock		**1,081 09**	
Miscellaneous		**1,251 80**	**8,739 67**
			$22,624 72

Disbursements

Labor and supplies		**$9,810 79**	
Stock		**1,868 45**	
Expense		**1,012 76**	
Permanent Improvements—New Road	**$1,585 55**		
Field Stone..	**393 96**		
Bldg. Repairs	**949 48**	**2,928 99**	**15,620 99**
Cash on hand April 1, 1911			**$7,003 73**

Inventory April 1, 1911

3 Bulls	**$365 00**		
68 Cows and Heifers	**2,805 00**		
2 Pr. Oxen	**360 00**		
6 Horses	**1,695 00**		
24 Sheep and 16 Lambs	**213 00**		
Stock Feed	**1,573 00**		
Vehicles	**499 00**		
Machinery	**678 50**		
Barn Tools	**20 00**		
Hay Tools	**67 00**		
Plumbers' Tools	**23 50**		
Carpenters' Tools	**38 85**		
Dairy Tools	**299 00**		
Ice Tools	**48 00**		
Field Tools	**53 00**		
Harness	**139 50**		
Material	**181 00**		
Furniture	**84 95**	**9,143 30**	
Inventory, April 1, 1910		**6,327 20**	
Inventory Increase		**2,816 10**	
Farm Receipts		**8,739 67**	
Farm Disbursements			**11,679 24**

84)

Depreciation (10% of Real Estate Act.)		1,717 54
Loss	1,841 01	
	13,396 78	13,396 78

Expense item of $1,012.76, covering officers' salaries, traveling expense, office expense, telephone, insurance, surveying, photographs, etc., is charged off to dividend account.

GILBERT FARM COMMITTEE

Report of Gilbert Farm for Year Ending March 31, 1912

Cash on hand, April 1, 1911			$7,003 78
Dividend Gilbert & Bennett Mfg. Co.			7,200 00
Farm Receipts—	Milk	$10211 34	
	Stock	1933 96	
	Miscellaneous	974 38	13119 68
			27323 41
Disbursements—	Labor	7206 52	
	Supplies	8722 48	
	Stock	5241 44	
	Expense	844 26	22014 70
Cash on hand April 1, 1912			5308 71

	Labor	Supplies	Total	
*New Road	$477 16	$191 15	$668 31	
*New Silo	175 64	320 73	496 37	
*New Fence	143 18	137 13	280 31	
*Building Repairs	274 87	546 87	821 84	
*Water System Repairs and Ice Pond	97 70		97 70	
*Field Stones	613 07		613 07	
*Brush	62 73		62 73	$3040 33
Stock	2114 41		2114 41	
Dairy	1468 55	586 76	2055 31	
Laboratory		42 13	42 13	
Equipment	184 29	1275 90	1460 19	
Stock Feed	81 91	3987 58	4069 49	

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*Permanent Improvements charged to Real Estate account.

Wagons and Harness		216 00	216 00	
Fuel	150 12	79 60	229 72	
Fruit	125 71	29 07	154 78	
Corn	438 40		438 40	
Potatoes	96 60		96 60	
Hay	189 33		189 33	
Grass Seeding	27 56		27 56	
Ice	66 91		66 91	
Roots	199 90		199 90	
Bedding	105 25	316 20	421 45	
Fertilizer	150 91	834 45	985 36	
Furniture		89 01	89 01	
Milk Bought		69 80	69 80	
Entertaining Visitors	42 32		42 32	1,288 67
	$7206 52	$8722 48		$15929 00

Classified Stock Disbursements

1	Percheron Stallion	$ 900 00
4	Reg. Holstein Cows	900 00
14	Grade Holstein Cows	1150 50
10	Reg. Jersey Cows	1750 00
3	Grade Jersey Cows	210 00
	Shipping and Traveling Expense	295 94
	Registry Fees	20 00
	Service Fees	15 00
		$5241 44

Expense Items

Manager's Salary	$600 00
College Faculty Demonstration Days	64 67
Telephone	50 40
Stationery	31 52
Traveling Expense	97 67
	$844 26

Inventory April 1, 1912

1	Jersey Bull	$ 275 00
1	Yearling Bull	85 00
2	Bull Calves	10 00
83	Cows, Heifers and Calves	5685 00
1	Pair Oxen	170 00
9	Horses	2535 00
21	Sheep and 11 Lambs	180 00
	Stock Feed	1160 00
	Vehicles	499 00
	Harness	186 00
	Machinery	826 00

Field Tools	46 00	
Barn Tools	8 00	
Hay Fork Tools	64 00	
Plumbers' Tools	13 00	
Carpenter Tools	33 00	
Dairy Tools	337 00	
Laboratory Apparatus	67 00	
Ice Tools	43 00	
Material	368 00	
Furniture and Dishes	151 00	$12641 00
Stamford Inv. (Auto, Team, Desk)	$ 600 00	
Stamford Bills Rec.	1002 26	1602 26
		$14243 26
Inv. April 1, 1911		9143 30
Increase		5099 96

Farm Disbursements		$22014 70
Expense Charged to Dividend Acct.	$ 844 26	
Labor and Supplies Used in Permanent Improvements	3040 33	
Farm Receipts	13119 68	
Increase of Inventory	5099 96	
Gain		89 53
	$22104 23	$22104 23

Real Estate Account $18498 17

10% of it charged to Year's Business	$1849 81
	89 53
Showing Loss in Year's Business	$ 1760 28
Leaving Real Estate Account	16648 36

GILBERT FARM DAIRY—STAMFORD BRANCH

For Year Ending March 31, 1912

Sales

51543 Quarts Milk	$6501 67
1912½ Quarts Cream	1738 64
458 lbs. Butter	193 08
1659 Dozen Eggs	598 98
355 Quarts Skimmed Milk	21 42
6 Quarts Buttermilk	40
27 Barrels Apples	52 68
Percentage for Collecting	68 89
	$9175 70

Disbursements

Paid Farm	$4474 66
Milk and Cream Extra	15 11
Paid for Eggs	508 88
Butter	184 75
Rent and 'Phone	384 80
Maintaining Auto	155 65
Maintaining Horse and Wagon	291 96
Route, Horse, Wagon, Auto	866 30
Furniture	23 85
Labor	882 00
Stationery and Advertising	195 20
Butter Boxes	8 50
Traveling Expense	47 23
Incidentals	117 88
Balance in Stamford Bank	16 73
Bills Rec.	1002 26
	$9175 70

Analysis

After paying all bills contracted by reason of Stamford Department, there remains tangible for consideration of milk, cream and apples sent to Stamford from Gilbert Farm.

Cash Paid Farm	$4474 66		
Cash in Stamford Bank	16 73		
Bills Rec. (Believed to be good)	1002 26		
Inv. Personal Property	600 00		$6093 65
Allowing all we received for apples		52 68	
Figuring Skim Milk at 3c. per qt.		10 65	
Figuring Cream at 50c. per qt.		956 12	1019 25
Leaves for the 51543 quarts of milk			$5073 40

Which is 9.84c. per quart.

Deducting 1c. per quart for transportation and the .84c., which amounts to $433.00, for depreciation on bottles, caps, cases, etc., we have a net of 8c. per quart for all milk sent to Stamford.

From a business point of view, I believe the Stamford milk market the best thing in sight for making the farm self supporting. As for practice for our graduates, and an example for farmers, I believe the demonstration of marketing dairy products a most important feature. We are supplying milk that is appreciated, and are not competing with any private enterprise.

ARTHUR J. PIERPONT,
Manager

I am sorry to report a loss of $1760.28. I have conducted the Farm and business in what I believed to be for the best interests of the

College and the fulfilment of Mr. Gilbert's wishes and not always for the greatest financial gain.

Ten per cent. of the Real Estate account, $1849.81, seems a large rent for a small rocky farm, but I believe it proper to charge it to the year's business before determining the real profit or loss. Real Estate account was opened with the original appraisal of the Real Estate when it was bequeathed to the College, and there has been added to it yearly the cost of permanent improvements.

Ten per cent. of the account, after adding each year's permanent improvement, has been deducted and charged to each respective year's operating expense.

Financial Report For Year to October 1, 1911

Appropriations and Accounts Showing Excess of Receipts Above Expenditures

Annual State Appropriation		$25000 00
Annual Federal Appropriation		50000 00
Income From Federal Endowment		6750 00
Hicks Prize		60 00
Rent		4576 43
Interest		794 24
Fees		4525 50
Farm		211 08
Miscellaneous Receipts		1050 26
SPECIAL APPROPRIATIONS		
Furnishing New Dining Hall		5000 00
Electric Lights		8000 00
CASH BALANCE Sept. 30, 1910		
State Fund	$12222 51	
Land Grant Fund	116 28	
Morrill Fund	33059 23	45398 02
		$151365 53

Accounts Showing Excess of Expenditures Above Receipts

SALARIES		
Officers	$ 7091 64	
Instructors	31876 01	
Employees	1203 35	
Scholarships	983 08	
Lecturers	201 37	$41355 45
DEPARTMENTS		
Dairy	2918 89	
Horticulture and Care of Grounds	4294 85	
Permanent Improvement to Grounds	7765 44	
Poultry	1115 22	
Horse Barn	379 02	
Boarding	453 63	
Forestry	112 93	
Botany	496 91	
Military	311 34	
Library	903 13	
Domestic Science	164 61	
Mechanical	266 65	
Extension Work	1921 11	21103 73

NEW BUILDINGS AND EQUIPMENT		
Apparatus and Supplies for Instruction	6524 82	
Additions and Repairs to Equipment	901 57	
Furnishing Horticulture Building	185 00	
New Dining Hall	2275 69	
Furnishing New Dining Hall	4678 54	
New Water Line	2631 07	
Egg Laying Contest Buildings	500 93	
Real Estate	600 00	
George Jacobson's Cottage and Farm	6000 00	
Electric Lights	12 12	24309 74
REPAIRS AND MAINTENANCE		
Repairs to Buildings	5963 28	
Fuel and Light	3573 31	
Engineer and Firemen	1063 36	
Janitor Work and Supplies	1922 13	
Insurance	1729 86	
Operation of Sewage Plant	24 67	14276 61
SUPPLIES AND SERVICES FOR STUDENTS		
Pew Rent	533 32	
Medicines	2 00	
Stationery and Supplies	137 49	672 81
ADMINISTRATION EXPENSE		
Telephone and Telegrams	176 91	
Traveling Expense	917 39	
Printing	1044 13	
Postage	507 46	
Office Stationery and Supplies	256 93	
Advertising	714 14	
Entertainment of Guests	186 44	3803 30
GENERAL EXPENSE		
Freight and Express	195 39	
Cartage and Transportation	572 88	
Laundry and Supplies for Grove Cottage	65 57	
Hicks Prize	25 00	858 84
		$106380 58
CASH BALANCES Sept. 30, 1911		
State Fund	9019 82	
Land Grant Fund	21 37	
Morrill Fund	35943 76	44984 95
		$151365 53

Gilbert Farm

Balance September 30, 1910	$6809 51
Receipts—Farm Products and Interest on Endowment	17397 65
	$24207 16
Expenditures	$19342 64
Balance September 30, 1911	4864 52
	$24207 16

Financial Report For Year to October 1, 1912

Appropriations and Accounts Showing Excess of Receipts Above Expenditures

Annual State Appropriation		$25000 00
Annual Federal Appropriation		50000 00
Income from Federal Endowment		6750 00
Hicks Prize		60 00
Rent		5012 90
Interest		681 49
Fees		6265 00
Miscellaneous Receipts		334 00
Agricultural Extension		2500 00
Special Appropriation—Cottages		20000 00
CASH BALANCE Sept. 30, 1911		
State Fund	$9019 82	
Land Grant Fund	21 37	
Morrill Fund	35943 76	$44984 95
		$161588 34

Accounts Showing Excess of Expenditures Above Receipts

SALARIES		
Officers	$ 7475 80	
Instructors	34803 14	
Employees	1266 00	
Scholarships	975 70	
Lecturers	299 46	$44820 10
DEPARTMENTS		
Farm	2364 08	
Dairy	2668 63	
Creamery	555 32	

Hort. and Care of Grounds	5358 36	
Permanent Improvements to Grounds	2757 95	
Poultry	921 31	
Horse Barn	991 53	
Boarding	1460 91	
Forestry	114 05	
Botany	687 22	
Military	428 94	
Library	1358 89	
Domestic Science	169 39	
Mechanical	979 45	
Extension Work	2610 28	23426 31
NEW BUILDINGS AND EQUIPMENT		
Apparatus and Supplies for Instruction not included elsewhere	1691 51	
Additions and Repairs to Equipment	1420 10	
New Dining Hall	5227 82	
Furnishing New Dining Hall	330 35	
Egg Laying Contest Plant	4493 15	
Cottages	9163 62	
Electric Lights	8047 49	
New Dormitory for Boys	1587 97	
New Horse Barn	578 82	
New Dairy Barn	455 63	
Agricultural Hall Addition	27 28	
New Poultry Building	31 80	33055 54
REPAIRS AND MAINTENANCE		
Repairs to Buildings	9165 90	
Fuel and Light	3181 86	
Engineer and Firemen	1327 01	
Janitor Work and Supplies	2039 69	
Insurance	1617 89	
Operation of Sewage Plant	24 12	17356 47
SUPPLIES AND SERVICES FOR STUDENTS		
Pew Rent	800 00	
Stationery and Supplies	193 81	
Commencement	114 85	1108 66
ADMINISTRATION EXPENSES		
Telephone and Telegrams	269 32	
Traveling Expenses	1092 97	
Printing	594 49	
Postage	255 86	
Office Stationery and Supplies	206 39	
Advertising	333 74	
Entertainment of Guests	227 77	2980 54

GENERAL EXPENSES		
Freight and Express	157 23	
Cartage and Transportation	611 17	
Laundry and Supplies for Grove Cottage	146 96	
Hicks Prize	60 00	975 36
CASH BALANCE Sept. 30, 1912		
State Fund	3290 14	
Land Grant Fund	240 21	
Morrill Fund	34335 01	37865 36
		$161588 34

Gilbert Farm

Balance Sept. 30, 1911	$ 4864 52
Receipts—Farm Products and Interest on Endowment	19577 36
	$24441 88
Expenditures	$18701 58
Balance Sept. 30, 1912	5740 30
	$24441 88

Special Appropriation

Balance Unexpended for Eagleville Road Sept. 30, 1910		$9554 82
Paid H. L. M. Ladd Estate	$4182 76	
Paid John Costello	4202 07	
Paid Preble	182 71	
Paid C. A. Wheeler	116 59	
Balance Unexpended	870 69	$9554 82

Auditors' Certificates

Hartford, Conn., Nov. 16, 1911.

This is to certify that we have examined the accounts of D. W. Patten, Treasurer of the Connecticut Agricultural College, for the year ending September 30, 1911, have composed the same with the vouchers therefor and found them correct. We find the balances in the different funds on the above mentioned date were as follows:

State fund, on deposit with the Hartford Trust Co.	$ 9019 82
Land Grant Fund on deposit with the Willimantic Trust Co.	21 37
Morrill Fund on deposit with the First National Bank of Stafford Springs	10943 76
State and U. S. Fund on deposit with the Willimantic Trust Co.	1472 37
Gilbert Farm Fund on deposit with the Charter Oak National Bank of Hartford	4995 57
	$26452 89

We also find that the above mentioned treasurer holds a certificate of deposit of the Hartford Trust Co., dated July 13, 1911, No. 2570 for the sum of twenty-five thousand dollars, $25,000.

WILLIAM P. BAILEY,
EDWARD S. ROBERTS,
Auditors of Public Accounts

Hartford, Conn., Dec. 19, 1912.

This is to certify that we have examined the accounts of E. O. Smith, Treasurer of the Connecticut Agricultural College, for the period beginning August 1, and ending September 30, 1912. Have compared the same with the vouchers therefor and find them correct.

We find the balances in the different funds on the last mentioned date were:

State Fund on deposit with the Hartford Trust Co.	$ 3362 04
Morrill Fund on deposit with First National Bank, Stafford Springs	9335 01
Land Grant Fund on deposit with the Willimantic Trust Co.	240 21
State and U. S. Fund on deposit with the Willimantic Trust Co.	3491 57
Gilbert Farm Fund on deposit with the Charter Oak National Bank of Hartford	5740 30
	$22169 13

We also find that the above mentioned Treasurer holds a certificate of deposit of the Hartford Trust Co. for the sum of twenty-five thousand dollars ($25,000) No. 2619.

WILLIAM P. BAILEY,
EDWARD S. ROBERTS,
State Auditors

CHAPTER XXXV.

An Act Concerning Reports of State Institutions

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section 1. It shall be the duty of the officers of each institution and commission of this State, who are required by law to report to the Governor or to the General Assembly, to give, in the financial statement of receipts and expenditures contained in their respective reports, a detailed statement of the salaries paid to each and every officer and employee for the year ending with the 30th day of September next preceding.

Section 2. This Act shall not apply to any officer or employee whose compensation is less than four hundred and fifty dollars per annum.

Approved, March 17, 1897.

Officers and Employees of the College Who Received More Than $450.00 Were Paid at the Annual Rates Shown Below

Name	Year 1910-1911	Year 1911-1912
C. L. Beach	$4000 00	$4000 00
L. A. Clinton	3000 00	3000 00
A. G. Gulley	2500 00	2500 00
J. M. Trueman	2500 00	2500 00
A. F. Blakeslee	2100 00	2200 00
C. D. Jarvis	2100 00	2200 00
H. R. Monteith	2100 00	2200 00
E. O. Smith	2100 00	2200 00
F. H. Stoneburn	2100 00	2200 00
C .A. Wheeler	2100 00	2200 00
W. M. Esten	1900 00	2000 00
H. L. Garrigus	1700 00	1800 00
W. F. Kirkpatrick	....	1800 00
G. H. Lamson, Jr.	1600 00	1700 00
J. N. Fitts	1600 00	1700 00
H. D. Newton	1500 00	1600 00
A. T. Stevens	1100 00	1500 00
E. B. Fitts	1500 00	1500 00
Alberta T. Thomas	1400 00	....
H. D. Edmond	1300 00	1300 00
Maud E. Hayes	1100 00	1200 00
Edwina Whitney	1100 00	1200 00
S. P. Hollister	....	1200 00
George A. Blake	....	1200 00
F. C. Gunther	1000 00	1100 00
Susy D. Rice	1000 00	1000 00
L. F. Rettger	900 00	900 00
Christie J. Mason	900 00	900 00
Mary C. Rogers	800 00	850 00
George Fraser	864 00	864 00
John L. Hughes	......	800 00
Fred Gill	800 00	800 00
Lillian E. Berry	700 00	750 00
Edna M. Butler	650 00	660 00

Minnie Voetsch	660 00	660 00
Elizabeth Donovan	650 00	650 00
Lucy Murphy	600 00	......
Edna Jackson	480 00	600 00
Cora D. Grant	600 00	600 00
May Gilligan	......	600 00
E. B. Mix	480 00	540 00
Pauline Hopson	480 00	500 00
A. F. Rolf	600 00	......
A. M. Pollard	480 00	720 00
S. Plowsky	......	559 32
D. C. Flaherty	663 00	755 42
W. F. Ladd	600 00	720 00
Jacob Wharmby	600 00	600 00
Alex. Fraser	......	600 00
Henry Day	540 00	600 00
C. H. Copeland	......	563 30
Alfred Warren	......	519 16
B. S. Hawkins	......	540 00
Will Day	480 00	540 00
David Brown	480 00	540 00
L. Crane	480 00	540 00
Selah Palmer	480 00	540 00
Joseph Brown	480 00	480 00
Thomas Brown	480 00	540 00
Chas. Suter	480 00	480 00
Thomas Markland	480 00	480 00
Nicholas Markland	480 00	480 00
J. J. Kerwin	669 48	493 13
H. P. Crane	540 00	......

State of Connecticut
PUBLIC DOCUMENT No. 24

Thirty-sixth Annual Report

OF

The Connecticut Agricultural Experiment Station

Being the annual report for the year ending October 31

1912

PRINTED BY ORDER OF THE LEGISLATURE

HARTFORD
PUBLISHED BY THE STATE
1913

PUBLICATION
APPROVED BY
THE BOARD OF CONTROL.

THE TUTTLE, MOREHOUSE & TAYLOR COMPANY

CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

OFFICERS AND STAFF.

September 30, 1912

BOARD OF CONTROL.

His Excellency, Simeon E. Baldwin, *ex officio, President.*

Prof. H. W. Conn, *Vice President*	Middletown
George A. Hopson, *Secretary*	Wallingford
E. H. Jenkins, *Director and Treasurer*	New Haven
Joseph W. Alsop	Avon
Wilson H. Lee	Orange
Frank H. Stadtmueller	Elmwood
James H. Webb	Hamden

STATION STAFF.

Administration.	E. H. Jenkins, Ph.D., *Director and Treasurer.* Miss V. E. Cole, *Librarian and Stenographer.* Miss L. M. Brautlecht, *Bookkeeper and Stenographer.*
Chemistry.	
Analytical Laboratory.	John Phillips Street, M.S., *Chemist in Charge.* E. Monroe Bailey, Ph.D., C. B. Morison, B.S., R. B. Roe, A.B., C. E. Shepard, *Assistants.* Hugo Lange, *Laboratory Helper.* V. L. Churchill, *Sampling Agent.*
Proteid Research.	T. B. Osborne, Ph.D., *Chemist in Charge.* Miss E. L. Ferry, A.B., *Assistant.* Miss Luva Francis, *Stenographer.*
Botany.	G. P. Clinton, S.D., *Botanist.* E. M. Stoddard, B.S., *Assistant.* Miss M. H. Jagger, *Seed Analyst.* Miss E. B. Whittlesey, *Herbarium Assistant.*
Entomology.	W. E. Britton, Ph.D., *Entomologist; also State Entomologist.* B. H. Walden, B.Agr., D. J. Caffrey, B.S., H. B. Kirk, *Assistants.* Miss F. M. Valentine, *Stenographer.*
Forestry.	Samuel N. Spring, M.F., *Forester; also State Forester and State Forest Fire Warden.* W. O. Filley, *Assistant; also Asst. State Forester.* Miss E. L. Avery, *Stenographer.*
Plant Breeding.	H. K. Hayes, M.S., *Plant Breeder.* C. D. Hubbell, *Assistant.*
Buildings and Grounds.	William Veitch, *In Charge.*

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REPORT OF THE BOARD OF CONTROL
OF
THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

To His Excellency, Simeon E. Baldwin, Governor of Connecticut:

The Board of Control of The Connecticut Agricultural Experiment Station herewith respectfully submits its report for the year ending November 1, 1912.

The following changes in the Station staff have occurred:

Samuel N. Spring, B.A., M.F., who has served the State and Station most efficiently as their forester for three years, resigned on October 1, 1912, to accept a professorship in Cornell University.

Mr. W. O. Filley, the assistant forester, has been appointed to fill this vacancy in our staff, and Mr. A. E. Moss, M.F., a graduate of The Connecticut Agricultural College and of the Yale Forest School and later a forestry assistant of the United States Forest Service, has been appointed assistant Station forester.

R. B. Roe, B.A., who has served as an assistant chemist for three and one-half years, resigned in October to accept a position in a chemical research laboratory.

Harry B. Kirk, formerly for two years assistant in economic zoölogy in the Pennsylvania Department of Agriculture, was appointed an assistant in the Entomological Department in February, 1912.

An exhibit illustrative of the work of the several departments of the Station was made at three of the agricultural fairs during the fall, with members of the staff in attendance to explain it and answer questions. While such exhibits have seriously interrupted the Station work, they have proved to be most effective in bringing its results immediately and in a striking way to those who should get practical benefit from them.

The same purpose is also served by frequent addresses before granges, farm institutes, field meetings, etc. During the year ninety addresses of this sort have been made by members of the staff in response to requests.

While the attendance of the Station staff at fairs, farm institutes and other meetings has been necessary and profitable, it has taken much time which was greatly needed for its experimental study and work, which are the Station's special sphere.

The rapid development of the so-called agricultural extension, in which the national government is expected to coöperate with the agricultural colleges, should reduce the necessity for these outside activities on our part. The greatest efficiency of the Station can only be secured by the uninterrupted course of its special work. On the other hand, the extension of agricultural teaching and demonstration by new agencies abundantly provided with funds but not so amply supplied with trained teachers puts an added responsibility on both College and Station to do thoroughly and with the least possible interruption the sound teaching and painstaking research on which the whole agricultural extension effort must rest, if it is not to prove an injury rather than a blessing.

The valuable Station library, now numbering about 8,000 volumes, had until this year no suitable place for orderly arrangement and easy reference. The quarters formerly used for a chemical laboratory have recently been equipped with steel shelving, electric lights and other necessary furnishings, and the general consulting library with the various card catalogues has been installed in it, under the direction of Miss Cole, the librarian.

The Report of the Station staff, which is printed with this report of its Board of Control, makes unnecessary any detailed statement of what has been done. The Report itself describes only that part of the work which is of present importance to farmers, but besides this there have been printed in scientific journals eighteen papers giving the results of Station investigations.

The following incomplete summary will show the scope of the Station's work:

CHEMICAL DEPARTMENT.

Seven hundred and eighty samples of fertilizers and manures and 273 of feeding stuffs have been analyzed and the results published. Twelve hundred and fifty samples of human food products and 395 samples of drugs have been examined, the results published, adulterated samples reported to the Dairy and Food Commissioner, and evidence furnished in court trials in eighteen cases.

Over 2,000 samples of food products have been weighed or measured as a basis for establishing regulations on the subject, as required by an Act of the last General Assembly.

An improved method of determining starch in meat products has been devised and much coöperative work done for the Association of Official Agricultural Chemists.

BOTANICAL DEPARTMENT.

The orchard experiment at Yalesville (now in its fourth year) on a block of 900 trees is planned to determine the effect of fertilizers on growth, yield, winter injury, occurrence of yellows, and bearing life of the trees.

The effects of different sprays on peaches, apples and other fruits have been carefully tested.

Studies of muskmelons—with reference to varieties, spraying and disease resistance,—of the calico of tobacco, of peach yellows, and extensive experiments and study of the nature and spread of the chestnut blight are also in progress.

Seeds sent by seedsmen and farmers, and some samples bought by the Station have been tested as to vitality and, where necessary, as to purity, to the number of 863.

ENTOMOLOGICAL DEPARTMENT.

This department has determined the life histories of three little-known and destructive insects and the means for combating them.

Studies on the white pine weevil are not yet concluded.

It has coöperated by furnishing inspection, information and advice to organizations and individuals who have engaged in mosquito control work.

It has inspected the 54 nurseries of the State, covering some 770 acres; 30 orchards and gardens; 987 packages of imported nursery stock; and 153 apiaries containing 1431 colonies.

The gypsy moth has been so nearly exterminated at Stonington that very careful search fails to discover a single specimen, and at Wallingford very few specimens have been found. These two very threatening invasions have thus been stamped out.

The brown-tail moth work in the northeastern part of the State has shown a great diminution of the pest where work was done last year, but a gradual spread of the invasion. This work could and should be done by local authorities and not left for the State.

FORESTRY DEPARTMENT.

About 528,000 forest seedlings have been supplied at cost to owners of Connecticut forest land for planting, and about 290,000 are ready for sale in 1913.

The Station's experimental forests at Rainbow and Enfield have needed little except fire protection.

About 76,000 seedlings have been set in the State Forests. One lot of twenty acres badly infected with chestnut disease has been cut clean and is to be set to pine in 1913. No fire has occurred on either of these tracts.

An accurate type and stock map of the Portland Forest has been made, with a plan for the permanent management of the forest.

The number of spring fires, 254, and the estimated damage, $21,700, have been much less than in the previous year, owing partly to the plentiful rain and partly to increased efficiency of the fire warden service. During the danger season two lookout stations and fire patrols of certain railroad lines—services which were paid for chiefly by a United States government appropriation—greatly helped in promptly discovering and extinguishing forest fires.

Twenty-seven examinations of forest tracts ranging in size from 10 to 500 acres were made for and at the request of the owners and advice given as to their treatment.

A full report has been made on the woodworking industries of the State in coöperation with the United States Forest Service and will soon be published.

The State forester was made a member of the Commission on the Taxation of Forest Land, and the field work necessary to secure information on the matter was put in his charge. This has required a very careful and laborious study of forest conditions, the results of which will appear in the Commission's report.

PLANT BREEDING.

(Supported by Adams Eund.)

Mr. Hayes has continued the study of tobacco, to determine precisely how different measurable characters of the plant—such as size, shape and number of leaves, height of plants, etc.—are inherited by crosses or hybrid plants, and to discover any fixed relation that there may be between these and the subtile characters which make "quality." The practical purpose is to find a way in which improved strains of tobacco may be produced. Many thousand measurements of single plants have been made for this study, and 35 row selections of 250 plants each have been separately harvested, cured and fermented and are immediately to be sorted and judged as to quality by experts. The commercial side of this work is in coöperation with the United States Department of Agriculture.

Further tests of the merits of using for seed first generation hybrids of corn have been made at the experiment field, as also a study of the effects of crossbreeding and inbreeding of tomatoes. Other work has been on selections of rye, testing the value of selection in forest seeding, and on developing an improved variety of muskmelon.

PROTEIN RESEARCH.

(Supported by Adams Fund.)

This department, being devoted wholly to technical research, is supported by the Adams Fund, which, according to Act of Congress, must be spent wholly for such work.

The nutritive effect of the separate proteins or flesh-forming materials of food has been the main object of study this year and has yielded very valuable results.

The Station correspondence has involved the writing of 11,922 letters and manuscript reports. (Main office 5,357, chemical department 623, botanical 507, entomological 2,823, forestry 2,107, plant breeding 200, protein research 305.)

During the year there have been issued a report of 445 pages with 32 plates in an edition of 10,000 copies, and four bulletins aggregating 77 pages with 12 plates in editions of 9,500.

A technical bulletin of 45 pages with 5 plates was issued in an edition of 2,000 copies.

We wish again to call attention to the pressing needs of the Station. In 1895 the General Assembly appropriated $10,000 to the Station as an annual payment for its support, and the same amount has been paid yearly ever since. But in the meantime it has, by various Acts, greatly increased the amount of work required of the Station without in any case providing additional funds to meet these requirements, nor was this work of a kind which could be paid from funds appropriated by the national government. Thus:

In 1899 the Assembly passed a law regulating the sale of cattle feeds, requiring the Station to collect samples and make and publish analyses of the different brands yearly, but with no appropriation for the work.

In 1901 the law regarding insect pests was passed, appropriating to this Station $3,000 for the use of the State Entomologist in executing the law, creating the office of State Entomologist but providing that he shall receive no salary other than that which he received as a member of the Station staff, i. e., his salary was to be paid from Station funds.

At the same session the office of State Forester was created and with the same provision as to payment of his salary.

An Act of this session also required that all apparatus used in determining fat in dairy products as a basis of payment should be tested and marked by this Station or by the Agricultural College, but no appropriation was made for it. All this work, not very large in any one year, has been done without charge at this Station.

In 1903 a law was passed regarding renovated butter, which placed further work on this Station.

In 1907 the Assembly passed a bill much more elaborate than previous ones on the same subject, to prevent the sale of adulterated, misbranded or poisonous foods, drugs and liquors. It only repealed those parts of existing statutes which were inconsistent with it. This law, with the increased public attention which has been drawn to the subject and with the extension of the work to cover drugs and liquors, has greatly increased the work required of the Station with no addition to its means of meeting the demands.

The General Assembly recognized the increased work involved by increases in the salaries of the Dairy and Food Commissioner and his deputy commissioner and in provision for the expenses of their office, but made no further provision for the chemical work involved.

The Assembly in 1911 passed an Act concerning Adulteration of Turpentine, which is to be enforced by the Dairy and Food Commissioner and the Director of this Station "acting jointly." About 150 samples of turpentine have already been examined, of which 30 were adulterated.

The same session of the General Assembly passed an Act requiring a statement of the net quantity of contents to be marked on all food products in packages, and providing that the Dairy and Food Commissioner and the Director of this Station shall establish rules regarding allowances to be made for variations from the alleged net weight of such packages. There are no published data on the subject and we are therefore making an extensive series of weighings of certain package goods and containers to determine the present range of net weights in the market. The Dairy and Food Commissioner buys what goods are required; the Station does the work.

In no one of the cases cited above has any appropriation been made to the Station to cover the cost of the work.

The result has been that the Station, at the sacrifice of agricultural experiment and research work which is its proper function, has been forced to do this control work and to use for it funds which should rather have been devoted to the object for which this Station was established: namely, agricultural investigation and experiment.

At the same time, the proper demands made on the Station for assistance in all branches of farming have greatly increased. It is no longer possible for the Station to meet all these. Its income can no longer meet its expenses and unless it is more adequately supported it will be necessary to curtail its present field of work, making it rather a control station than an agricultural experiment station. The call for sound research in the interest of practical agriculture was never so pressing as it is now. It surely is not the time to force this, the first established Station in the country, to curtail its experimental work.

The above statement of the facts and present situation requires no argument to show the reasonableness of the request of this Board that the General Assembly will increase the annual Station appropriation by $7,500, which by careful estimate is the amount which must be yearly spent in the control work above mentioned for which the State has never made appropriation, and the appropriation for insect pest work by $1,000.

All of which is respectively submitted.

GEORGE A. HOPSON, *Secretary.*

REPORT OF THE TREASURER, 1912.

E. H. Jenkins, in account with The Connecticut Agricultural Experiment Station for the fiscal year ending September 30, 1912.

Receipts.

Balance on hand, October 1, 1911 (Analysis Fees)		$ 52.60
State Appropriation, Agriculture	$10,000.00	
State Appropriation, Food	2,500.00	
State Appropriation, Insect Pest	3,000.00	
State Appropriation, Gypsy Moth	2,500.00	
United States Appropriation, Hatch	7,500.00	
United States Appropriation, Adams	7,500.00	
Analysis Fees	5,500.00	
Sale of Mt. Carmel Farm to Lockwood Trust	6,000.00	
Sale of Farm Products	386.99	
Miscellaneous Receipts	75.61	
From the Lockwood Income	11,046.13	
		56,008.73
Total		$56,061.33

Disbursements.

E. H. Jenkins, director, salary		$2,800.00
E. H. Jenkins, treasurer, salary		400.00
G. A. Hopson, salary		100.00
V. E. Cole,	“	850.00
L. M. Brautlecht,	“	750.00
J. P. Street,	“	2,500.00
T. B. Osborne,	“	2,400.00
E. M. Bailey,	“	1,550.00
C. B. Morison,	“	1,200.00
R. B. Roe,	“	1,125.00
C. E. Shepard,	“	900.00
W. E. Britton,	“	2,000.00
G. P. Clinton,	“	2,200.00
E. M. Stoddard,	“	900.00
S. N. Spring,	“	2,500.00
W. O. Filley	“	1,500.00
H. K. Hayes,	“	1,500.00
Edna L. Ferry,	“	1,008.34
H. Lange,	“	925.00
V. L. Churchill,	“	825.00

Wm. Veitch, salary	$ 675.00	
E. L. Avery, "	480.00	
H. W. Kiley (Labor)	728.00	
Wm. Pokrob "	728.00	
C. D. Hubbell "	728.00	
Geo. Graham "	728.00	
M. H. Jagger "	520.00	
Labor	3,746.46	
Publications	676.18	
Postage	205.81	
Stationery	423.52	
Telephone and Telegraph	162.53	
Freight and Express	285.49	
Gas, Kerosene and Electricity	748.11	
Coal	1,625.70	
Water	148.88	
Chemicals and Laboratory Supplies	1,205.18	
Agricultural and Horticultural Supplies	232.13	
Miscellaneous Supplies	574.69	
Fertilizers	386.61	
Feeding Stuffs	372.27	
Library and Periodicals	750.77	
Tools and Machinery	464.17	
Furniture and Fixtures	1,184.67	
Scientific Apparatus	166.31	
Live Stock	200.00	
Traveling by the Board	106.61	
Traveling by the Staff	1,144.31	
Traveling in connection with Adams Fund Investigations	98.11	
Fertilizer Sampling	233.64	
Food Sampling	183.34	
Insurance	140.00	
Insect Pest Appropriation to State Entomologist	3,000.00	
Contingent	186.50	
Lockwood Expenses	400.00	
Gypsy Moth Appropriation to State Entomologist	2,500.00	
New Buildings	58.00	
Betterments	389.89	
Repairs	328.27	
Rental of Land	160.00	
		$55,008.49
Balance on hand, October 1, 1912:		
Analysis Fees	$755.17	
State Agricultural Appropriation	297.67	
		1,052.84
Total		$56,061.33

NEW HAVEN, Oct. 31st, 1912.

THIS IS TO CERTIFY that we have examined the accounts of E. H. Jenkins, Treasurer of The Connecticut Agricultural Experiment Station, for the year ending Sept. 30, 1912, have compared the same with the vouchers therefor and found them correct.

WILLIAM P. BAILEY,
EDWARD S. ROBERTS,
Auditors of Public Accounts.

ERRATA.

Page 12. It is stated that the Humphreys, Godwin Co. has made a rebate to buyers when the cotton seed meal sold by it was found to contain less nitrogen than was guaranteed. It might be inferred from this statement that the other firms there named had not done this, but we have since been advised that the Apothecaries Hall Co., of Waterbury, and W. Newton Smith, of Baltimore, have also given similar rebates.

Page 92. The guaranteed percentage of phosphoric acid in Wizard Brand Manure, sold by the Pulverized Manure Co., Chicago, analysis number 377, is incorrectly stated as four.

The statement that this brand contains much less phosphoric acid than is guaranteed is also incorrect.

One per cent. of phosphoric acid is guaranteed and this guaranty is fully met.

Page 362, line 4 from bottom, read Moravian instead of Bavarian.

PART I.

Report on Commercial Fertilizers, 1912.

By E. H. JENKINS, *Director,* and JOHN PHILLIPS STREET, *Chemist in charge of the Analytical Laboratory.*

The statutes relating to the trade in commercial fertilizers have been fully explained in previous reports and are so generally understood by dealers that further reference to them is deemed unnecessary in this report.

OBSERVANCE OF THE FERTILIZER LAW.

During 1912, forty-four individuals and firms have entered for sale in this state three hundred and sixty-nine brands of fertilizers, classified as follows:

Nitrogenous superphosphates	266
Bone manures and "bone and potash"	29
Fish, tankage, castor pomace and chemicals	74
Total	369

SAMPLING AND COLLECTION OF FERTILIZERS.

During April, May and June, Mr. V. L. Churchill, the sampling agent of this station, visited one hundred and fifteen towns and villages in Connecticut to draw samples of commercial fertilizers for analysis. These places were distributed as follows:

Litchfield County	10
Hartford County	37
Tolland County	8
Windham County	9
New London County	9
Middlesex County	11
New Haven County	22
Fairfield County	9
	115

In these places seven hundred and fifty-seven samples were taken.

The agent could not find the following brands which had been entered for sale in the state: American Agricultural Chemical Co.'s Dried Blood, Wheat and Haymaker, Ground Untreated Phos. Rock; Lister's Special 10 per cent. Fertilizer*; Munroe & Sons' Unleached Wood Ashes; National H. G. Top Dressing, Swift's Lowell Nitrate Soda, Muriate Potash, Tankage.

With two exceptions, no analyses of these brands could therefore be made.

CLASSIFICATION OF THE FERTILIZERS ANALYZED.

	Number of Samples.
1. *Containing nitrogen as the chief active ingredient.*	
Nitrate of soda	15
Dried blood and blood tankage	3
Cotton seed meal	295
Castor pomace	3
Linseed meal	1
2. *Containing phosphoric acid as the chief active ingredient.*	
Ground phosphate rock	3
Basic slag or Thomas phosphate	14
Precipitated bone	3
Dissolved rock phosphate or acid phosphate	10
3. *Containing potash as the chief active ingredient.*	
High grade sulphate of potash	9
Double sulphate of potash and magnesia	2
Muriate of potash	14
Kainit	3
Vegetable potash	1
Cotton boll and cotton hull ashes	8
4. *Containing nitrogen and phosphoric acid.*	
Fish manures	14
Tankage	12
Egg tankage	1
Kanona	1
Bone manures	35
5. *Mixed fertilizers.*	
Acid phosphate and potash	3
Commercial mixtures	279
Home mixtures	16
6. *Miscellaneous fertilizers, manures and amendments.*	35
Total	780

* A sample sent by the manufacturer was analyzed.

EXPLANATIONS CONCERNING THE ANALYSES.

The analyses given on the following pages show the percentage quantities of nitrogen, phosphoric acid and potash present in the samples, and, where possible, their solubilities. These solubilities give some indication as to the probable availability to crops.

Each printed analysis is the average of two closely agreeing analyses made independently by two expert analysts following the methods of the American Association of Official Agricultural Chemists.

Samples are numbered consecutively as received. The numbers having risen to 28,000, the numeration has been begun this year at unity again for the sake of economy of space in printing.

The average cost of most of the samples is calculated from the prices quoted by the sellers of the goods. In some cases quite different prices are charged by dealers for the same goods. *These quotations, therefore, should be regarded only as a general guide,* not at all as a basis for individual purchases.

When materials contain either nitrogen, phosphoric acid or potash as the single fertilizer ingredient, the cost per pound of that ingredient is easily calculated from the ton price and the analysis. Thus, if a sample of muriate of potash contains 50.2 per cent. of potash, which is 1004 pounds per ton, and costs $42.50 per ton, actual potash costs 4250 ÷ 1004, or 4.2 cents per pound.

Fertilizers which are mixtures of various raw materials and contain two or more of the fertilizer ingredients above named are reported with an attached valuation.

VALUATION OF FERTILIZERS.

There is so much misunderstanding as to the meaning of the term valuation as it is used in our fertilizer reports that particular attention is called to the following explanations:

The valuation of a fertilizer is the result of calculating the retail cash cost at freight centers of an amount of nitrogen, phosphoric acid and potash in high grade materials equal to the amount contained in one ton of the fertilizer. It is a valuation of only one factor which makes up the cost of a fertilizer, namely, the market cost of the three kinds of plant food in it.

Valuation no more shows the fair retail price of a fertilizer than quotations of steel billets can show the fair price for small amounts of structural steel of a specified shape. If, however, the prices of steel remain fairly uniform, a comparison of these quotations with the rates charged by different companies *in open competition* for the finished product is a help, though not a perfect guide, to the buyer in studying the bids of different manufacturers.

To illustrate: Of two fertilizers, A and B, let us assume that A contains 3.5 per cent. of organic nitrogen, 4.5 per cent. of water-soluble, 3 per cent. of citrate-soluble and 1 per cent. of insoluble phosphoric acid and 6 per cent. of potash, and sells at retail for $35.00. B contains 2.0 per cent. organic nitrogen, 3.5 per cent. of water-soluble, 3 per cent. citrate-soluble and 4 per cent. insoluble phosphoric acid and 8 per cent. of potash, and retails for $32.00.

We assume that both are in good condition, sold by well-known and reputable manufacturers, and the prices are the best obtainable for these two brands. The question is, which is the better purchase: 70 pounds of nitrogen, 150 pounds of soluble phosphoric acid, 20 pounds of insoluble phosphoric acid and 120 pounds of potash at $35.00; or 40 pounds of nitrogen, 130 pounds of soluble phosphoric acid, 80 pounds of insoluble phosphoric acid and 160 pounds of potash for $32.00. Obviously the first thing to do is to get the approximate value of all these separate ingredients in one figure so as to have some common basis of comparison. In a ton of A are 70 pounds of organic nitrogen, which can be bought for about 19 cents a pound; 150 pounds of soluble phosphoric acid, which can be bought for 4½ cents per pound in form of acid phosphate; 20 pounds of insoluble phosphoric acid, for which we may allow 2 cents per pound; 120 pounds of potash, which can be bought in form of muriate for 4¼ cents per pound.

Calculating as follows,

$$\begin{array}{rl} 70 \times 19 & = 13.30 \\ 150 \times 4\tfrac{1}{2} & = 6.75 \\ 20 \times 2 & = .40 \\ 120 \times 4\tfrac{1}{4} & = \underline{5.10} \\ & \ 25.55 \end{array}$$

it appears that the plant food in fertilizer A can be bought, at freight centers, in raw materials, for about $25.55, and a similar calculation shows that the corresponding figure for fertilizer B is $21.85. These two figures are the "valuations" of the two fertilizers. Each gives a single figure to represent the *trade value of the actual plant food* in each of these two fertilizers, A and B, but they do not at all show the fair market price of the goods.

Valuations do not, of course, show the agricultural value of the plant food in fertilizers. Nor do they show the cost to the manufacturer of the stock which he used in the mixture. His profit comes in part from skill and judgment in buying the plant food on the most favorable terms. The valuation shows simply what it would cost the farmer to buy the same amount of plant food as the mixed fertilizer contains, at freight centers, unmixed, in raw materials of good quality.

But the cost of the plant food contained in a mixed fertilizer is but one item, though the largest single item, in its cost. Other items are grinding and mixing, bags, freight, agents' commissions, as well as other items, overhead factory charges, losses and profits.

It cannot be stated too emphatically that the valuation does not and cannot show the fair retail price of fertilizers, but only one item—the largest item to be sure—of the cost. In fact one must add ten dollars or more to the valuation to approximate what would be, in most cases, a fair selling price.

Fertilizer A costs $35.00, and the plant food in it has a valuation of $25.55. Fertilizer B costs $32, and its plant food a valuation of $21.85. The charges for converting the raw materials into a uniform mixture and delivering it are $9.45 in A and $10.15 in B; or, in A about 37 per cent. of the valuation of the plant food in it, and in B 46.4 per cent.—figures which we call percentage difference between cost and valuation. Assuming the substantial accuracy of the costs of plant food and that the nitrogen, phosphoric acid and potash are equally valuable in both brands, it is clear that A is a better purchase than B. For while the difference between cost and valuation (i. e., the cost of manufacture and selling) is only 70 cents more in B than in A, in the latter it is about 46 per cent. of the value of the raw material, and in the former only about 37 per cent.

To recapitulate:

1. Valuation represents one item, and the largest item, in the cost of mixed commercial fertilizers. It is a valuation of only one factor which makes up the market price, namely, the average market cost of the untreated raw materials of high quality which enter into its composition.

2. It affords a basis for estimating, approximately, the fair selling price.

3. It affords a basis of comparing fertilizers which differ considerably in composition and price.

4. It does not represent the fair selling price.

5. It does not show the agricultural value of the ingredients in it.

The trade-values used in the calculations made in this report are only approximately correct, for market prices constantly fluctuate, but they are accurate enough to be used to compare fertilizers which are on sale at the same time.

TRADE-VALUES OF FERTILIZER ELEMENTS FOR 1912.

The average trade-values or retail costs in market, per pound, of the ordinarily occurring forms of nitrogen, phosphoric acid and potash in raw materials and chemicals, as found in New England, New York and New Jersey markets during 1911 and adopted at a conference of representatives of the New England, New York and New Jersey Stations in March, 1912, are as follows:

	Cents per pound.
Nitrogen in nitrates and ammonia salts	16½
Nitrogen, organic, in fine dry fish and blood	22
in cotton seed meal and castor pomace	20
in fine* bone and tankage and in mixed fertilizers	19
in coarse* bone and tankage	15
Phosphoric acid, water-soluble	4½
citrate-soluble† and in fine bone and tankage, cotton seed meal and castor pomace	4
in coarse bone and tankage and ashes	3½
in acidulated goods insoluble in water or citrate solution	2
Potash in high grade sulphate and mixtures free from muriates	5¼
cotton seed meal and castor pomace	5
muriate	4¼

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* In this report "fine," as applied to bone and tankage, signifies smaller than 1/50 inch; "coarse," larger than 1/50 inch.

† Dissolved from 2 grams of the fertilizer, previously extracted with pure water, by 100 cc. neutral solution of ammonium citrate, sp. gr. 1.09, in thirty minutes at 65° C., with agitation once in five minutes. Commonly called "reverted" or "backgone" phosphoric acid.

The foregoing are, as nearly as can be estimated, the average prices at which, during the six months preceding March last, the respective ingredients were retailed for cash, in our large markets, in those raw materials which are the regular source of supply. The valuations obtained by use of the above figures will be found to correspond fairly with the average retail prices, at the large markets, of standard raw materials.

METHOD OF VALUATION OF BONE AND TANKAGE.

To obtain the valuation of ground bone or tankage the sample is sifted into two grades, that finer than $\frac{1}{50}$ inch, "fine," and that coarser than $\frac{1}{50}$ inch, "coarse."

The nitrogen value of each grade is separately computed by multiplying the pounds of nitrogen per ton by the per cent. of each grade, multiplying the product by the trade-value per pound of nitrogen in that grade, and taking this final product as the result in cents. Summing up the separate values of each grade thus obtained, together with the values of each grade of phosphoric acid, similarly computed, the total is the valuation of the sample.

METHOD OF VALUATION OF MIXED FERTILIZERS.

The organic nitrogen in mixed fertilizers is reckoned at 19 cents per pound, nitrogen of nitrates, and ammonia salts and phosphoric acid in its three forms of solubility, at the prices given above. Potash is rated at 4¼ cents, if sufficient chlorine is present in the fertilizer to combine with it to make muriate. If there is more potash present than will combine with the chlorine, then this excess of potash is reckoned at 5¼ cents per pound, except in certain special cases, to be noted later, where carbonate of potash has been used in the mixture.

To obtain the Valuation of a Fertilizer, multiply the pounds per ton of nitrogen, etc., by the trade-value per pound. The several products give the values per ton of the several ingredients and their sum is the total valuation per ton.

Percentage Difference shows the percentage excess of the cost price over the average retail cost, at freight centers, of the nitrogen, phosphoric acid and potash contained in the fertilizer. It shows in a general way the cost of manufacture and sale of the mixture expressed in percentage of the cost of the raw materials composing it.

This information helps the purchaser to determine whether it is better economy to buy the commercial mixed fertilizers, of which so many are now offered for sale, or to purchase and mix for himself the raw materials.

I. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN.

NITRATE OF SODA OR SODIUM NITRATE.

Nitrate of soda is mined in Chili and purified there before shipment. As offered in the Connecticut market this year, it contains about 15.4 per cent. of nitrogen, equivalent to 93.5 per cent. of pure sodium nitrate. The other usual constituents are moisture and small quantities of common salt and Glauber's salt (sodium sulphate).

363. Sold by Nitrate Agencies Co., New York. Stock of J. F. Merrill, Suffield.

360. Sold by Bowker Fertilizer Co., New York. Stock of W. O. Goodsell, Bristol.

272. Sold by Coe-Mortimer Co., New York. Stock of Spencer Bros., Suffield.

270. Sold by American Agricultural Chemical Co., New York. Stocks of Chas. Templeton, Waterbury, and F. S. Platt Co., New Haven.

235. Stock of Apothecaries Hall Co., Waterbury.

533. Sold by Wilcox Fertilizer Co. Stock of T. H. Eldredge, Norwich.

539. Sold by Rogers Manufacturing Co., Rockfall.

274. Sold by L. T. Frisbie Co., New Haven. Stock of Lightbourn & Pond, New Haven.

712. Sold by Fertilizer Materials Supply Co. Stock of H. P. Beers, Greens Farms.

640. Sold by F. S. Royster Guano Co., Baltimore. Stock of C. E. Kempton, Pomfret Center.

281. Sold by American Agricultural Chemical Co., New York, per E. Manchester's Sons, Winsted. Sampled and sent by John Gotta, Portland.

188, 263 and **237.** Sold by Sanderson Fertilizer and Chemical Co., New Haven. **188** from stock of Connecticut School for Boys, Meriden; **263** sampled and sent by E. B. Sniffen, Stratford; **237** from stock bought by C. R. Treat, Orange.

ANALYSES OF NITRATE OF SODA.

Station No.	363	360	272	270	235	533	539
Percentage amounts of							
Nitrogen guaranteed	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Nitrogen found	15.44	15.64	15.40	15.38	15.00	15.76	15.20
Equivalent sodium nitrate	93.75	94.96	93.51	93.38	91.08	95.69	92.29
Cost per ton	$48.00	50.00	50.00	51.25 55.00	50.00	54.00	52.00
Nitrogen cost cents per pound	15.5	15.9	16.2	16.7 17.9	16.7	17.1	17.1

Station No.	274	712	640	281	188	263	237
Percentage amounts of							
Nitrogen guaranteed	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Nitrogen found	15.44	15.74	15.46	15.36	15.36	15.10	15.40
Equivalent sodium nitrate	93.75	95.54	93.87	93.26	93.26	91.69	93.50
Cost per ton	$53.00	55.00	55.00	.....	.....	.....	.....
Nitrogen cost cents per pound	17.2	17.4	17.8	.....	.....	.....	.....

The above table shows:

1. That the percentage of nitrogen in nitrate of soda, as it is sold in Connecticut, has ranged from 15.00 to 15.76. A part of this difference may be due to the absorption of water by the nitrate. For example, a bag of nitrate of soda weighing 200 pounds may contain when sold 15.65 per cent. or 31.3 pounds of nitrogen. If in transit and storage it gathers 6 pounds of moisture it will contain only 15.2 per cent. of nitrogen, but the total quantity of nitrogen in the bag will be as before, namely 31.3 pounds.
2. Nitrate could be readily bought this year at retail for $50 per ton, and a pound of nitrogen in this form costs from 15.9 to 16.7 cents.
3. The price charged by different agents for the same stock varies greatly. See No. 270.

While nitrogen in nitrate bought in small lots of agents has cost about 16.5 cents per pound, it has been bought in mixed car lots *for cash* by farmers and farmers' clubs at prices ranging from 14.9 to 15.7 cents per pound.

The great economy of buying either chemicals or mixed fertilizers *for cash* and in quantity is so obvious and has been so persistently urged by us that no further comment seems necessary.

A sample sent by the F. F. Rockwell Company of Putnam and stated to have been received by them with the label "Nitrate of Soda," **633**, contained only 14.04 per cent. of nitrogen as nitrate, 4.45 per cent. of matter insoluble in water and considerable amounts of chlorides and sulphates. It was not commercial nitrate of soda, but an impure nitrate either of soda or potash.

DRIED BLOOD AND BLOOD TANKAGE.

Two samples of dried blood drawn from stock of L. M. Benham and Andrew Ure, Highwood, Nos. **226** and **242**, contained respectively 13.00 and 13.10 per cent. of nitrogen. Over 77 per cent. of the nitrogen was in active form and its cost was 20.6 cents per pound.

A sample of Blood Tankage sent by S. L. Tuttle, Gaylord Farm, Wallingford, and bought of the Sanderson Fertilizer & Chemical Co., contained 7.50 per cent. of nitrogen and 5.83 per cent. of phosphoric acid. Eighty-two per cent. of the nitrogen present was in active forms.

COTTON SEED MEAL.

(ANALYSES ON PAGES 14 TO 24.)

Two hundred and ninety-five samples of this material have been analyzed this year, representing about 6,500 tons sold within the state, and a cash outlay of something over $200,000, chiefly by tobacco growers.

The analyses of these samples are given in a following table. Names of the commission men or brokers from whom the meal was bought are given where they are known, and where they are not known, the names of the Connecticut dealers are given instead. With each sample is given the number of the car in which it was received and the person or firm which bought it.

The cost of nitrogen per pound is calculated in each case by allowing $4.42 for the phosphoric acid and potash in one ton, subtracting this from the ton cost and dividing the remainder by the number of pounds of nitrogen in the ton. Undecorticated meals contain much less phosphoric acid and potash, and no cost of nitrogen is calculated for them.

Sample **419**, page 24, was drawn from car No. 67097 by Olds & Whipple. Sample **412** was drawn later from the same car by J. B. Parker, when it was received at Windsor. Full particulars as to the method of sampling in each case are not at hand, but the nitrogen determinations show the differences likely to occur if the samples are not drawn from a sufficiently large number of sacks.

A study of the table shows that

1. The highest price paid has been $35.00 for high-grade meal, the lowest $26.50, for low-grade, and the average price has been $31.20. It should be said, however, that the prices in the table are those originally charged, but where the nitrogen fell below the guaranty, the price has been in most cases proportionately reduced.

2. The per cent. of nitrogen has ranged from 7.6 to 4.87, the average being 6.58 per cent., which is 0.4 per cent. lower than last year. If there are excluded thirty samples which are very obviously undecorticated meal, the average percentage of nitrogen is 6.69, and average cost $31.50.

3. The cost of nitrogen in cotton seed meal has ranged from 23.5 to 17.4 cents and has averaged 20.2 cents per pound. From this calculation are excluded the undecorticated and very imperfectly decorticated samples.

4. The meal sold into the state this year has been of lower grade than ever before. A third of it has been sold for what it was not; that is, it has contained far less nitrogen than was claimed for it. Thus, of the 138 samples shipped by Humphreys, Godwin & Co., 44 per cent. were below guaranty; of the 86 shipped by W. Newton Smith, 16 per cent.; of the 19 sent by Olds & Whipple, with no statement of the firm from whom it was bought, 29 per cent. were below guaranty.

In this very unsatisfactory condition of things, the Station analyses make it possible for every buyer to protect himself by claiming from the seller a rebate for every unit of nitrogen deficient in the meal which he buys.

The difficulties of commission men in the matter of guaranties have been sufficiently explained in previous reports. The amount of time and trouble now spent in adjusting claims for shortage of nitrogen, if applied by them to forcing manufacturers to tell the truth regarding their output of meal, would put the trade on a more satisfactory basis.

Special attention is called to twenty samples of meal from Humphreys, Godwin & Co., which contain less than six per cent.

of nitrogen. The five at and near the end of the tabulation of samples of meal sold by them have been further examined as follows:

No.	Nitrogen.	Ash.	Fiber.
165	4.87	4.83	17.13
192	5.30	5.91	13.46
193	5.27	5.46	13.49
212	4.94	4.91	17.39
228	5.34	5.56	13.90
Average good decorticated meal, 144 analyses	7.14	6.60	4.90
Average undecorticated meal	4.04	4.9	18.50

It is clear that these, and at least fifteen others, are not cotton seed meals as that term is understood in the trade,* but fine ground, undecorticated, or only partially decorticated, meal, all of them sold with a guaranty of 6.5 per cent., and running from one-half per cent. to more than one and one-half per cent. below this guaranty. Delivery of such meal ought to be refused, and the parties directly responsible for the fraud or "accident," that is, the manufacturers of it, should be prosecuted. If the commission houses who deal in such meal will not stop the fraud at its source, it will be necessary to hold them responsible under the federal and state laws.

The same observations also apply to at least six samples from Apothecaries Hall Company, four samples from the Buckeye Cotton Oil Co., and several from W. Newton Smith, which contained less than six per cent. of nitrogen, were far below their guaranties and were undecorticated meals. It should be said that the Humphreys-Godwin Co., when notified of the analysis of the meal referred to, promptly made a rebate to the purchaser, covering the deficiency in nitrogen.

Those who wish to have samples of meal examined at the station must bear in mind that proper sampling is no less important than accurate analysis, and that careless sampling makes the analysis worse than useless. The seller will not and should not accept an analysis, unless he has proof that the sample was properly drawn. At least twenty bags should be opened in every car lot and about a pint taken from each, by thrusting the hand or a cup down into the meal. These samples should then be mixed carefully, and two samples drawn from the mixture, one to be sent to the station and the other held for the manufacturer in case it is called for. The one who samples should be prepared to make affidavit as to the date, number of car, number of bags opened, etc. The sample sent to the station should be fully described on a blank, which will be furnished on application.

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* According to the Commercial Fertilizer of July 12, 1912, the cotton oil trade at its annual association meeting adopted a definition of cotton seed meal and declared that nothing should be recognized, traded in, or sold as cotton seed meal which had less than 38 per cent. of protein. This is the equivalent of 6 per cent. of nitrogen.

This information should be given to the station before the analysis is undertaken, for the station has no right to do work with state funds unless it has some assurance that the work, when done, will be of value to the public. Frequently we receive samples with no marks to identify them, broken packages from which a part or all the sample has run out over the mail matter, samples quite too small to be representative, and samples not of stock delivered in the state, but of what some shipper *proposes* to supply. These, of course, are worthless, but they are not positively harmful, whereas a sample of meal on sale in the state, which is apparently all right, but has not been carefully drawn, may do great injustice either to buyer or seller.

CASTOR POMACE.

(ANALYSES ON PAGE 25.)

Castor pomace, a residue from the manufacture of castor oil, and extremely poisonous to stock, which will eat it greedily if they have the chance, is used more or less as a fertilizer for tobacco. Three samples have been examined:

ANALYSES OF COTTON SEED MEAL, 1912.

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
	American Cotton Oil Co.					
334	....	P. Rogers..............................	6.49	6.50	$31.00	20.5
	Apothecaries Hall Co.					
85	11618..........................	Bissell-Graves Co.....	6.06	6.25	26.00	17.8
111	24972..........................	" "	5.85	6.25	26.00	....
108	15348..........................	" "	5.72	6.25	26.00	....
86	32651..........................	" "	5.71	6.25	26.00	....
66	577819..........................	" "	5.64	....	26.00	....
110	35065..........................	" "	5.61	6.25	26.00	....
109	635..........................	" "	5.59	6.25	26.00	....
	Bainbridge Oil Co.					
97	....	Amer. Sumatra Tobacco Co...............	6.62	....	30.00	19.3
96	....	" " "	6.56	....	30.00	19.5
98	....	" " "	6.56	....	30.00	19.5
100	....	" " "	6.50	....	30.00	19.7
99	....	" " "	6.46	....	30.00	19.8
	F. W. Brode and Co.					
190	23646..........................	Olds and Whipple........................	7.03	6.58	31.00	18.9
150	70180..........................	" "	7.02	6.58	30.00	18.2
117	13068..........................	" "	7.01	6.58	30.00	18.2
127	17490..........................	" "	6.96	6.58	30.00	18.4
151	516465..........................	" "	6.95	6.58	30.00	18.4
609	79643..........................	Conn. Tobacco Corporation	6.92	6.58	31.50	19.6
144	98237..........................	Olds and Whipple........................	6.90	6.58	29.00	17.8
92	5833..........................	" "	6.88	6.58	30.00	18.6

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
161	10548	Olds and Whipple	6.86	6.58	$30.00	18.6
126	132319	" "	6.77	6.58	29.00	18.2
60	4667	" "	6.74	6.58	29.00	18.2
69	79873	" "	6.72	6.58	29.00	18.3
91	109227	" "	6.70	6.58	30.00	19.1
104	16458	" "	6.70	....	30.00	19.1
206	34003	" "	6.60	6.58	31.00	20.1
440		L. B. Haas and Co.	6.48	6.58	30.50	20.1
602	No. 2	Conn. Tobacco Corporation	6.40	6.58	30.50	20.4
601	12363 (No. 1)	" " "	6.35	6.58	30.50	20.5
413		" " "	6.18	....	30.50	21.1
	Buckeye Cotton Oil Co.					
594		J. E. Shepard	6.65	6.25	32.00	20.7
180	26955	Apothecaries Hall Co.	6.20	6.25	26.50	17.8
179	14167	G. S. Phelps	5.98	6.25	26.50	....
154	12869	A. E. Potwine	5.80	6.25	26.50	....
178	14380	Apothecaries Hall Co.	5.79	....	26.50	....
155	97337	A. E. Potwine	5.72	....	26.50	....
	T. H. Bunch Co.					
8	"Old Gold"	R. B. Eno	6.27	6.50	31.00	21.2
	S. P. Davis					
711		E. W. Woodward	6.86	6.50	32.50	20.5
232		A. W. Camp	6.57	6.50	32.00	21.0
	Farmers' Cotton Oil Co.					
211		F. B. Hatheway	6.34	6.25	28.20	18.8

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
	Rodney J. Hardy and Sons.					
177	37703	Arthur Sikes and others	6.74	6.50	$30.50	19.4
189	137756	" " "	6.73	6.50	31.50	20.1
415	25770	" " "	6.69	....	32.50	21.0
416	31194	" " "	6.64	....	32.50	21.1
	Humphreys, Godwin and Co.					
6	37508	Olds and Whipple	7.60	7.70	35.00	20.1
158	136449	" "	6.88	6.99	32.00	20.0
353	Boat (W. No. 175)	" "	7.60	7.53	35.00	20.1
5	45201	" "	7.54	7.70	35.00	20.3
535	91597×73099	" "	7.36	....	35.00	20.8
573	Galveston	Spencer Bros., C. W. Bates	7.29	7.40	34.50	20.6
135	48666	Olds and Whipple	7.26	6.99	32.00	19.0
418	42581	" "	7.18	6.99	33.00	19.9
410	11742	L. C. Brainard and Co., J. E. Phelps	7.17	7.00	32.75	19.7
137	61879	C. F. Tilden	7.14	6.50	31.50	19.0
141	61879	L. C. Brainard and Co. and others	7.12	6.50	31.75	19.2
17	70373	Olds and Whipple	7.11	7.62	33.00	20.1
295	26528	" "	7.08	6.99	33.00	20.2
298	1746	" "	7.08	6.99	33.00	20.2
1	17580	" "	7.07	6.99	32.50	19.9
254	13616	" "	7.06	6.99	33.00	20.2
252	103789	" "	7.05	6.99	33.00	20.3
299	31232	" "	7.04	6.99	33.00	20.3
423	35606	" "	7.03	6.99	33.00	20.3
256	88205	" "	7.03	6.99	33.00	20.3
2	16813	" "	7.03	6.99	32.50	20.0
230	192441	" "	7.02	6.99	33.00	20.4
350	19022	" "	7.02	6.99	33.00	20.4
255	84859	" "	7.01	6.99	33.00	20.4

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
16	9696	Olds and Whipple	7.00	7.62	$33.00	20.4
424	43195	" "	7.00	6.99	33.00	20.4
123	22052	" "	7.00	6.99	32.00	19.7
136	15679	" "	7.00	6.99	32.00	19.7
422	16257	" "	6.99	6.99	33.00	20.5
25	19925	" "	6.99	7.62	33.00	20.4
409	111408	L. C. Brainard and Co., J. E. Phelps	6.98	7.00	32.75	20.3
686	21175	Loomis Bros. Co.	6.98	6.50	30.25	18.5
15	14231	Olds and Whipple	6.98	7.62	33.00	20.5
14	92789	" "	6.97	7.20	33.50	20.9
84	52403	" "	6.97	6.99	32.50	21.4
143	15793	L. C. Brainard and Co.	6.96	6.50	30.50	18.7
251	2004	Loomis Bros. Co. and others	6.96	6.50	31.00	19.1
355	14862	Olds and Whipple	6.96	6.99	33.00	20.5
691	19544	" "	6.95	6.58	33.00	20.6
411	19423	L. C. Brainard and Co. and others	6.95	7.00	33.00	20.6
27	1647	Olds and Whipple	6.94	7.20	33.50	20.9
119	30615	" "	6.94	6.99	32.00	19.9
201	65655	Spencer Bros., G. A. Harmon	6.94	6.50	28.50	17.4
142	53413	L. C. Brainard and Co., O. Pitcher	6.92	7.00	32.15	20.0
10	11674	Olds and Whipple	6.92	7.20	33.50	21.0
420	97574	" "	6.92	6.99	33.00	20.7
494	98587	Spencer Bros., J. Sullivan	6.92	6.50	29.75	18.3
36	68393	Olds and Whipple	6.90	6.99	32.00	20.0
57	18930	" "	6.90	6.99	32.00	20.0
149	62814	" "	6.90	6.99	32.00	20.0
332	9081	" "	6.90	6.99	33.00	20.7
354	30001	" "	6.90	6.99	33.00	20.7
392	62176	Spencer Bros. and others	6.90	6.50	28.50	17.5
18	32330	Olds and Whipple	6.89	7.20	33.50	21.1

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen. Found.	Per cent. of Nitrogen. Guaranteed.	Cost per ton.	Nitrogen costs cents per pound.
351	6094	Olds and Whipple	6.89	6.99	$33.00	20.7
65	55032	Spencer Bros. and others	6.88	6.50	29.50	18.2
35	16611	Olds and Whipple	6.86	7.20	33.50	21.2
138	104756	Loomis Bros. Co. and others	6.85	6.50	30.25	19.0
250	25309	" " "	6.85	6.50	31.00	19.4
12	78377	Olds and Whipple	6.84	7.20	33.50	21.3
68	65292	" "	6.84	6.99	31.50	19.8
204	26	Spencer Bros. and others	6.82	6.50	30.50	19.1
37	94598	Olds and Whipple	6.81	6.99	32.00	20.3
52	13364	" "	6.80	6.99	31.50	19.9
690	106924	" "	6.80	6.58	33.00	21.0
685	86359	Loomis Bros. Co. and others	6.79	6.50	33.50	21.4
82	1645	" " "	6.79	....	32.00	20.3
64	17023	Spencer Bros. and others	6.78	6.50	28.50	17.8
32	109790	" " "	6.76	6.50	29.50	18.6
83	13991	Loomis Bros. Co. and others	6.76	6.50	30.25	19.1
118	83178	Olds and Whipple	6.75	6.99	32.00	20.4
62	11055	Spencer Bros., H. Adams	6.74	6.50	28.50	17.9
29	45563	Olds and Whipple	6.74	7.20	33.50	21.6
689	93188	" "	6.71	6.58	33.00	21.3
152	9816	Loomis Bros. Co.	6.68	6.50	31.00	19.9
405	131788	Spencer Bros., J. Sullivan	6.68	6.50	29.75	19.0
81	5244	Loomis Bros. Co. and others	6.66	....	32.00	20.7
403	60647	Spencer Bros. and others	6.66	6.50	29.50	18.8
324	140697	" " J. B. Rose	6.64	6.50	30.00	19.3
33	102400	" " M. Leahey	6.63	6.50	29.50	18.9
401	130510	" " and others	6.60	6.50	31.50	20.5
404	55488	" " J. Sullivan	6.58	6.50	29.75	19.2
301	107042	Olds and Whipple	6.57	6.78	30.00	19.5
333		P. J. Rogers	6.56	6.18	....	....

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen. Found.	Per cent. of Nitrogen. Guaranteed.	Cost per ton.	Nitrogen costs cents per pound.
197	38282	Olds and Whipple	6.55	6.58	$31.00	20.3
302	123108	" "	6.54	6.78	30.00	19.6
303	33193	" "	6.54	6.78	30.00	19.6
391	5322	Spencer Bros. and others	6.52	6.50	29.50	19.2
191	526955	Olds and Whipple	6.47	6.58	31.00	20.5
406	35357	Spencer Bros., J. Sullivan	6.46	6.50	29.75	19.6
687	11726	Olds and Whipple	6.45	6.58	33.00	22.2
600	2988	" "	6.45	6.58	29.00	19.1
305	10920	" "	6.44	6.78	30.00	19.9
408	81577	L. C. Brainard and Co., C. Chapin	6.41	6.50	32.50	21.9
407	31815	" " " G. A. Douglas	6.41	6.50	30.50	20.3
194	366	Olds and Whipple	6.39	6.58	31.00	20.8
7		Spencer Bros	6.37	6.40	27.00	17.7
496	32105	" " and others	6.35	6.50	29.50	19.8
492	45908	" " "	6.32	6.50	33.00	22.6
497	70145	" " "	6.32	6.50	32.50	22.2
210	27438	Olds and Whipple	6.32	6.58	31.50	21.4
326	729	Spencer Bros., D. Barron	6.32	6.50	28.50	19.1
172	40535	" " and others	6.30	6.50	28.50	19.1
163	104283	" " E. A. Fuller	6.30	6.50	28.50	19.1
168	8713 and 17509	" " and others	6.29	6.50	30.00	20.3
202	13296	" " " "	6.26	6.50	28.50	19.2
304	117134	Olds and Whipple	6.24	6.78	30.00	20.5
224	36749	" "	6.21	6.58	31.00	21.4
200	25815	Spencer Bros., Mrs. C. F. Whittemore	6.18	6.50	28.50	19.5
491	93475	" " and others	6.18	6.50	33.00	23.1
171	60961	" " C. C. Bissell	6.18	6.50	28.50	19.5
170	82767	" " and others	6.18	6.50	30.00	20.7
227	27669	J. F. Carroll	6.16	....	29.25	20.2
160	93823	Olds and Whipple	6.14	6.17	27.00	18.4

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
169	6835 and 9591	Spencer Bros. and others	6.14	6.50	$30.50	21.2
400	88078	" " "	6.13	6.50	33.00	23.3
525		E. Halladay	6.07	6.18	33.00	23.5
173	81508	Spencer Bros. and others	6.02	6.50	30.00	21.2
495	20670	" " "	5.96	6.50	28.50	....
167	304372	" " "	5.96	6.50	30.00	....
162	87025	" " "	5.96	6.50	31.00	....
95	3232	" " "	5.95	6.50	30.00	....
115	79970	" " "	5.92	6.50	29.50	....
352	73999	Olds and Whipple	5.90	6.17	28.00	....
114	50935	Spencer Bros. and others	5.88	6.50	28.50	....
166	74533	" " "	5.79	6.50	30.50	....
174	4646	" " "	5.74	6.50	30.00	....
323	12848	" " D. Barron	5.66	6.50	28.50	....
402	13766	" " and others	5.64	6.50	29.50	....
493	83616	" " "	5.57	6.50	29.50	....
325	30508	" " "	5.54	6.50	30.50	....
159	87394	Olds and Whipple	5.52	6.17	27.00	....
229	33902	" "	5.38	6.58	29.00	....
228	191809	" " Keiser and Boasberg Co.	5.34	6.58	29.00	....
192	29438	" " Windsor Tob. Grow. Corp.	5.30	6.58	29.00	....
193	89824	" "	5.27	6.58	29.00	....
212	44219	Spencer Bros	4.94	6.50	30.00	....
165	44219	" " and others	4.87	6.50	30.00	....
	Olds and Whipple.					
357		C. A. Huntington	7.60	7.40	33.50	19.1
635		C. W. Porter	7.20	....	32.50	19.5
716	84321	Conn. Tobacco Corp.	7.08	6.58	31.00	18.8
717	62557	" " "	6.96	6.58	31.00	19.1

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen. Found.	Per cent. of Nitrogen. Guaranteed.	Cost per ton.	Nitrogen costs cents per pound.
838	25798	Griffin-Neuberger Tobacco Co., Clarksville	6.95	6.50	$31.50	19.5
833	40318	" " " "	6.92	6.50	31.50	19.6
603	13032	Conn. Tobacco Corp., Clarksville	6.94	6.58	31.50	19.6
607	37564	" " " "	6.86	6.68	31.50	19.7
604	84050	" " " "	6.77	6.58	31.50	20.0
836	21164	Griffin-Neuberger Tobacco Co., Clarksville	6.72	6.50	31.50	20.2
441	....	O'Connor-Haviland Tobacco Co.	6.64	....	31.00	20.0
835	24638	Griffin-Neuberger Tobacco Co., Clarksville	6.61	6.50	31.50	20.5
714	58203	Conn. Tobacco Corp.	6.59	6.58	31.00	20.2
834	31201	Griffin-Neuberger Tobacco Co., Clarksville	6.58	6.50	31.50	20.6
608	78460	Conn. Tobacco Corp	6.36	6.58	31.50	21.3
606	93185	" " "	6.32	6.58	31.50	21.4
715	4832	" " "	6.30	6.58	31.00	21.1
837	36593	Griffin-Neuberger Tobacco Co., Clarksville	6.22	6.50	31.50	21.8
605	44445	Conn. Tobacco Corp	6.18	6.58	31.50	21.9
	Quitman Oil Co.					
486	....	Amer. Sumatra Tobacco Co.	6.51	6.18	31.00	20.4
	D. W. Ranlet Co.					
176	8617	Arthur Sikes and others	6.73	6.50	30.50	19.4
	W. Newton Smith.					
576	70354	Olds and Whipple	7.20	....	33.00	19.8
399	46065	Spencer Bros., J. Davis	7.14	6.50	32.50	19.7
572	86715	" " and others	7.12	6.50	33.50	20.4
575	132146	Olds and Whipple	7.10	....	33.00	20.1
395	52044	Spencer Bros. and others	7.06	6.50	31.00	18.8
598	32567	Olds and Whipple	7.05	6.58	32.50	20.0
634	36874	" "	7.05	....	34.00	21.0

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen. Found.	Per cent. of Nitrogen. Guaranteed.	Cost per ton.	Nitrogen costs cents per pound.
485	14055	Arthur Sikes	7.02	....	$31.75	19.5
571	86559	Spencer Bros. and others	7.02	6.50	33.50	20.7
523		Conn. Tobacco Corp	6.96	....	.....	....
199	25179	Olds and Whipple	6.96	6.58	31.00	19.1
522	89580	" "	6.95	6.58	32.50	20.2
175	103100	Spencer Bros. and others	6.90	6.50	31.50	19.6
63	75275	" " "	6.90	6.50	30.50	18.9
67	4452	Olds and Whipple	6.86	6.58	30.00	18.6
93	35392	Spencer Bros. and others	6.85	6.50	30.00	18.7
94	65858	" " "	6.85	6.50	30.00	18.7
757	92075	Olds and Whipple	6.85	6.58	33.00	20.9
741	140356	" "	6.84	6.58	33.00	20.9
296	130836	" "	6.82	6.58	31.50	19.8
707	101230	" "	6.82	6.58	33.00	21.0
758	89524	" "	6.80	6.58	33.00	21.0
718	24476	" "	6.80	6.58	33.00	21.0
61	17131	" "	6.78	6.58	30.00	18.9
51	8506	" "	6.77	6.58	30.00	18.9
688	310417	" "	6.76	6.58	33.00	21.1
414	60504	Arthur Sikes and others	6.76	6.50	32.50	20.8
34	93628	Spencer Bros. and others	6.75	6.50	30.00	18.9
595	33935	Olds and Whipple	6.75	6.58	32.50	20.8
790	70654	" "	6.75	6.58	33.00	21.2
425	7881	Arthur Sikes and others	6.72	6.50	33.50	21.6
740	109216	Olds and Whipple	6.72	6.58	33.00	21.3
710	72146	" "	6.72	6.58	33.00	21.3
297	137470	" "	6.70	6.58	31.00	19.8
58	8740	" "	6.68	6.58	30.50	19.5
356	12906	" "	6.65	6.58	32.00	20.7

ANALYSES OF COTTON SEED MEAL, 1912.—*Continued.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
613	30128	Olds and Whipple	6.65	6.58	$33.00	21.5
198	12304	“ “	6.64	6.58	31.00	20.0
719	66220	“ “	6.63	6.58	33.00	21.5
112	8223	“ “	6.63	6.58	30.00	19.3
113	88734	Spencer Bros. and others	6.63	6.50	31.50	20.4
397	3473	“ “ “	6.62	6.50	31.50	20.5
103	24302	Olds and Whipple	6.61	6.58	30.00	19.3
223	114176	“ “	6.60	6.58	31.00	20.1
739	136510	“ “	6.60	6.58	33.00	21.6
331	14141 and 10607	“ “	6.60	6.58	32.00	20.9
164	18068 and 63780	Spencer Bros. and others	6.59	6.50	31.00	20.2
203	32323	“ “ “	6.58	6.50	31.50	20.6
708	94473	Olds and Whipple	6.58	6.58	33.00	21.7
398	65490	Spencer Bros. and others	6.56	6.50	31.50	20.6
253	20972	Olds and Whipple	6.56	6.58	31.50	20.6
692	73624	“ “	6.55	6.58	33.00	21.8
231	36507 and 24602	“ “	6.54	6.58	31.50	20.7
396	92705	Spencer Bros. and others	6.52	6.50	31.50	20.8
393	86589	“ “ “	6.52	6.50	32.50	21.5
207	29995	Olds and Whipple	6.51	....	31.50	20.8
489	78503	“ “	6.51	6.58	32.50	21.6
709	81364	“ “	6.51	6.58	33.00	22.0
209	20785	“ “	6.50	6.58	31.50	20.8
330	3438	“ “	6.50	6.58	32.00	21.2
610	30573	“ “	6.49	6.58	33.00	22.0
116	16456 and 133946	Spencer Bros. and others	6.49	6.50	30.00	19.7
249	55196	“ “ G. A. Peckham	6.48	6.50	31.50	20.9
534	32604	Olds and Whipple	6.48	6.58	32.50	21.7
596	7773	“ “	6.47	6.58	32.50	21.7
611	38227	“ “	6.46	6.58	33.00	22.1

ANALYSES OF COTTON SEED MEAL, 1912.—*Concluded.*

Station No.	Manufacturer or Jobber, Car No. or Marks.	Purchased, Sampled or Sent by	Per cent. of Nitrogen.		Cost per ton.	Nitrogen costs cents per pound.
			Found.	Guaranteed.		
417	8550	Arthur Sikes, E. S. Seymour	6.45	....	$31.75	21.2
394	49637	Spencer Bros. and others	6.44	6.50	32.50	21.8
248	35367	" " "	6.44	6.50	32.50	21.8
327	78906 and 3957	" "	6.43	6.50	31.50	21.1
208	116333	Olds and Whipple	6.40	6.58	31.50	21.2
574	35527	" "	6.39	....	33.00	22.4
706	94270	" "	6.38	6.58	33.00	22.4
612	30070	" "	6.36	6.58	33.00	22.5
300	2891	" "	6.35	6.58	31.50	21.3
488	9611	" "	6.34	6.58	32.50	22.1
614	20196	" "	6.32	6.58	33.00	22.6
599	20025	" "	6.30	6.58	32.50	22.3
490	93823	" "	6.25	6.58	32.50	22.5
487	1722	" "	6.20	6.58	32.00	22.2
597	44496	" "	6.20	6.58	32.50	22.6
419	67097	" "	6.18	6.58	31.50	21.9
157	14293	" "	5.97	6.58	30.00	....
421	26443	" "	5.97	6.58	31.50	....
412	67097	" " J. B. Parker	5.90	6.58	34.50	....
	J. E. Soper Co.					
233		C. H. Dexter & Sons	6.58	6.50	32.00	21.0
247		" " "	6.34	6.50	32.00	21.8
530		" " " T. J. Coleman	6.10	6.00	*29.00	20.1
	Jobber Unknown.					
523		Conn. Tobacco Corp.	6.96	....	.....	....
196		C. H. Dexter and Sons	6.06	....	32.00	22.8

245. Gray Pomace. Stock of Olds & Whipple, Hartford.

526. Sold by American Agricultural Chemical Co., New York. Stock of Seth Viets, West Suffield.

236. Sold by Baker Castor Oil Co., New York. Stock of Olds & Whipple, Hartford.

ANALYSES.

Station No.	245	526	236
Percentage amounts of			
Nitrogen, as ammonia	0.02	0.00	0.02
" organic, water-soluble	0.52	0.62	0.76
" " active insoluble	2.40	....	1.90
" " inactive insoluble	2.22	....	1.77
Total nitrogen	5.16	4.46	4.45
" phosphoric acid	1.84	....	1.65
" potash	1.07	....	0.97
Cost per ton	$25.00	25.00	25.00
Nitrogen cost cents per pound	**21.8**	**25.8**	**25.5**

The gray pomace contains over half a per cent. more of nitrogen than the others and at the same price is a more economical purchase. Castor pomace is the most expensive form of nitrogen at present used as a fertilizer on tobacco lands.

LINSEED MEAL.

A single sample, **484**, sent by W. M. Hinson, Hazardville, contained 5.34 per cent. of nitrogen. The five years tests made by this Station at Poquonock showed that linseed meal was an excellent source of nitrogen in tobacco fertilizers.

To make it worth consideration as a substitute for cotton seed meal it would have to be bought for about $24.00 per ton, far below its present price.

II. RAW MATERIALS CHIEFLY VALUABLE FOR PHOSPHORIC ACID.

GROUND PHOSPHATE ROCK.

216. Mt. Pleasant Tennessee Ground Phosphate Rock. This sample contained 25.43 per cent. of phosphoric acid.

Price $3.00 bulk or $4.00 in burlap bags, in car lots, f. o. b. Mt. Pleasant. Freight to New Haven, about $4.80.

At these prices phosphoric acid costs delivered in car lots in this state, about 1½ to 1¾ cents per pound.

637. Tennessee Phosphate, made by Central Phosphate Co., Mt. Pleasant, Tenn., sold by Apothecaries Hall Co., Waterbury, contains 25.80 per cent. of phosphoric acid and costs $12.00 per ton, making the cost of phosphoric acid 2.3 cents per pound.

898. Tennessee Phosphate, bought of John Ruhm, Jr., Mt. Pleasant, Tenn., by W. A. Henry & Son, Wallingford, contained 28.75 per cent. of phosphoric acid. 75 per cent. of the phosphate passed a 100 mesh sieve.

Car lots of Tennessee fine ground rock phosphate have been offered, delivered in Connecticut, in paper lined cars, for $7.60 per ton with a guaranty of 29¾ per cent. of phosphoric acid. This would be equal to a price of 1¼ cents per pound of phosphoric acid.

There seems to be no difficulty in shipping ground rock in bulk in a paper-lined car. Thirty tons fills an ordinary car to a depth of eighteen inches to two feet.

BASIC SLAG OR THOMAS PHOSPHATE POWDER.

This material is a finely ground slag produced by a special process of removing phosphorus from iron.

It contains from 17 to 19 per cent. of phosphoric acid, 35 to 50 per cent. of lime, 13 or more per cent. of iron and smaller quantities of magnesia and manganese.

Very little of the phosphoric acid is soluble in water, but by a conventional method of extraction (Wagner's method) the larger part of the phosphoric acid in slag of good quality is soluble in ammonium citrate. Pot and field experiments and practical experience have alike shown that the phosphoric acid of basic slag is quite readily available to crops and it has come into rather extensive use, particularly by orchardists.

Last year some basic slag of quite inferior composition was sold in this State, and in order to more certainly determine the quality of this year's purchases the fineness of all samples has been determined with standard sieves and the citrate-soluble phosphoric acid has been determined by the Wagner method.

The samples are as follows:

130. Sold by the Coe-Mortimer Co. Sampled and sent by F. H. Beers, Brookfield Centre.

153. Sold by American Agricultural Chemical Co. to E. Manchester's Sons. Sampled and sent by C. R. Newton, Woodbridge.

222. Sold by Fertilizer Materials Supply Co. to the Agricultural Station.

234. Sold by American Agricultural Chemical Co. Stock of F. S. Platt Co., New Haven.

241. Sold by the Coe-Mortimer Co. Stock of Lightbourn & Pond Co., New Haven.

243. Sold by Fertilizer Materials Supply Co. Stock of L. M. Benham, Highwood.

244. Sold by American Agricultural Chemical Co. Stock of Thos. Griswold & Son, South Wethersfield.

246. Sold by Ross Bros., Worcester. Stock of Olds & Whipple, Hartford.

257. Sold by Fertilizer Materials Supply Co. Sampled and sent by A. E. Plant, Branford.

279. Sold by American Agricultural Chemical Co. to E. Manchester's Sons. Sampled and sent by John Gotta, Portland.

364. Sold by Nitrate Agencies Co. Stock of J. F. Merrell, Suffield.

446. Sold by Wilcox Fertilizer Co., Mystic. Sampled at factory.

543. Sold by Sanderson Fertilizer and Chemical Co. Stock of S. L. Tuttle, Wallingford.

577. Sold by Apothecaries Hall Co., Waterbury. Sampled from their stock.

The table of analyses of basic slag shows:

1. The mechanical condition of all the samples is very satisfactory and quite uniform; about 60 per cent., by weight, is finer than a 200 mesh and only about 5 1-2 per cent. coarser than 50 mesh.

2. The per cent. of phosphoric acid ranges from 16.61 to 19.80, the average being 17.59.

3. The "citrate-soluble" phosphoric acid, excluding four samples, ranges from 14.71 to 16.84 and averages 15.57.

4. Four samples, all of them from the American Agricultural Chemical Co., contain respectively 13.65, 12.64, 13.42 and 10.07 per cent. of citrate-soluble phosphoric acid, being much below the average of all the others. The goods represented by these four samples were, however, bought and sold on a guaranty of 17 per cent. total and 11.9 soluble by the Wagner method and therefore practically met their guaranty.

5. The retail cost of phosphoric acid in basic slag has been about 4.6 cents per pound. It has been bought by farmers in mixed car lots for from 3.6 to 4.3 cents.

ANALYSES OF BASIC SLAG.

(Percentage Amounts)

	Mechanical Analysis.									Phosphoric Acid.				
Station No.	Coarser than 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 80.	80 to 100.	100 to 200.	Finer than 200.	Total.	"Available" Wagner Method.	Insoluble.	Cost per ton.	Phosphoric Acid costs, cents per pound.
130	...	1	1	3	3	12	8	14	58	19.80	16.84	2.96	$18.00	4.5
153	...	1	1	1	1	9	2	18	67	17.91	13.65	4.26	15.00	4.2
222	...	...	1	1	2	15	5	20	56	17.07	15.07	2.00	.....	...
234	...	2	1	1	1	8	4	21	62	17.65	12.64	5.01	17.50	4.9
241	...	1	1	2	3	12	5	19	57	18.41	15.75	2.66	17.00	4.6
243	...	...	1	2	3	14	4	19	57	16.98	15.24	1.74	.....	...
244	...	1	...	1	1	7	4	21	65	18.12	13.42	4.70	15.00	4.1
246	...	1	1	1	1	10	5	20	61	18.50	16.03	2.47	17.00	4.6
257	...	...	2	3	4	15	4	20	52	16.93	14.71	2.22	15.00	4.4
279	1	3	3	2	1	6	3	17	64	16.29	10.07	6.22	.....	...
364	...	1	...	1	1	10	4	19	64	17.71	15.95	1.76	16.00	4.5
446	...	...	1	2	3	14	4	19	57	16.61	15.53	1.08	16.00	4.8
543	...	1	1	1	1	14	6	21	55	17.05	15.38	1.67	.....	...
577	...	...	1	1	2	12	5	20	59	17.26	15.20	2.06	18.00	5.2
Averages,	0	1	1	1.5	2	11	4.5	19	60	17.59	14.68	2.91		
Average, excluding Nos. 153, 234, 244 and 279										17.63	15.57			

PRECIPITATED BONE.

This material, understood to be a by-product of glue manufacture, is a fine, dry, white powder, neutral in reaction and having the composition given below:

It is used chiefly as a tobacco fertilizer.

260. Sampled and sent by Olds & Whipple, Hartford.

11. Sent by the American Agricultural Chemical Co.

261. Sampled and sent by the Keiser & Boasberg Plantation from stock bought of Olds & Whipple.

ANALYSES OF PRECIPITATED BONE.

	260	11	261
Water-soluble phosphoric acid	0.94	35.81	0.80
Citrate-soluble phosphoric acid	37.71		37.71
Citrate-insoluble phosphoric acid	0.13	1.73	0.09
Total phosphoric acid	38.78	37.54	38.60

This material has over 37 per cent. of "available" phosphoric acid and sells at a price which makes the cost of "available" phosphoric acid about 5 cents per pound in mixed car lots.

DISSOLVED ROCK PHOSPHATE OR ACID PHOSPHATE.

This material is made by treating mineral phosphates or phosphate rock with oil of vitriol (sulphuric acid), which makes the phosphates largely soluble in water.

The guaranty gives the percentage of "available" phosphoric acid. This is a purely trade name for the sum of the water-soluble and citrate-soluble phosphoric acid. It has no reference to the actual availability of the phosphoric acid to crops. In the case of well-made acid phosphates, however, having domestic rock phosphates as a base, it is fair to assume that the greater part of the "available" phosphoric acid as defined above is actually readily available to crops.

The following analyses show the average composition of this material:

445. Stock of Wilcox Fertilizer Co., Mystic.

444. Sold by Nitrate Agencies Co., New York. Stock of J. F. Merrell, Suffield.

268. Sold by the American Agricultural Chemical Co., New York. Stocks of F. S. Platt Co., New Haven, and Apothecaries Hall Co., Waterbury.

581. Sold by F. S. Royster Guano Co., Baltimore. Stock of Wells & Downs, Killingly.

737. "High Grade Soluble Phosphate," sold by Coe-Mortimer Co. Stock of Spencer Bros., Suffield.

442. Sold by Bowker Fertilizer Co. Stocks of A. D. Bridge's Sons, Hazardville, and S. B. Wakeman, Saugatuck.

443. Sold by L. T. Frisbie Co., New Haven. Stock of Lightbourn & Pond, New Haven.

225. Sold by Fertilizer Materials Supply Co., New York. Stock of L. M. Benham, Andrew Ure and S. A. Flight, Highwood.

183 and **239.** Sold by Sanderson Fertilizer & Chemical Co., New Haven. **183** from stock of Connecticut School for Boys, Meriden. **239** from stock of C. R. Treat, Orange.

The table of analyses shows one sample, **443**, of lower grade than the others, guaranteed 12.0 per cent. available and selling at

Analyses of Acid Phosphate.

Station No.	445	444	268	581	737	442	443	225	183	239
Percentage amount of										
Water-soluble phosphoric acid	13.96	12.88	11.27	11.54	11.50	10.04	8.79	13.50	9.49	12.99
Citrate-soluble phosphoric acid	1.41	3.05	3.88	4.37	3.38	3.76	2.56	1.57	4.68	1.80
Citrate-insoluble phosphoric acid	1.20	1.29	1.08	0.26	1.18	1.47	0.82	0.74	1.53	1.45
Total phosphoric acid	16.57	17.22	16.23	16.17	16.06	15.27	12.17	15.81	15.70	16.24
Sum of water-soluble and citrate-soluble phosphoric acid found	15.37	15.93	15.15	15.91	14.88	13.80	11.35	15.07	14.17	14.79
"Available" phosphoric acid guaranteed	15.0	14.0	14.0	16.0	14.0	14.0	12.0	14.0	14.0	14.0
Cost per ton	$15.00	16.00	15.50	17.75	16.50	16.00	14.50	....	....	.....
"Available" phosphoric acid costs cents per pound	4.9	5.0	5.1	5.6	5.6	5.8	6.4	....	....	....

a lower price; but available phosphoric acid costs more in that than in any other. Only very rarely are low grades with low prices really economical to buy.

The cost of "available" phosphoric acid at retail has ranged from 4.9 to 6.4 cents per pound. In mixed car lots farmers have bought it at much lower prices, ranging from 3.6 to 4.4 cents per pound.

III. RAW MATERIALS OF HIGH GRADE CONTAINING POTASH.

HIGH-GRADE SULPHATE OF POTASH.

(Analyses on page 33.)

This chemical should contain about 90 per cent. of pure potassium sulphate (sulphate of potash), equivalent to about 49 per cent. of potassium oxide ("potash"), and it should be nearly free from chlorides. The nine samples analyzed were of good quality and, with one exception, met their guaranties.

This exception may be apparent rather than real. On page 9 we have noted that an over-weight of the package, caused by its drawing moisture, will cause a lowering of *percentage* composition without affecting the total amount of plant food in the bag. A slight increase in weight makes a large difference in the percentage composition of very high-grade goods like potash salts.

Thus, if a bag weighing 220 pounds net and containing 50 per cent. of potash absorbs 2 pounds of moisture, it will contain, of course, as much potash as it did before, but the *percentage* of potash will be only 49.55.

The same holds true for all the potash salts.

The ruling price of high-grade sulphate at retail, delivered, has been from $48 to $51 per ton, making the cost of actual potash in this form about 5 cents per pound.

DOUBLE MANURE SALT.

(Analyses on page 33.)

This material is frequently sold on a guaranty of "48-50 per cent. sulphate," which is equivalent to 25.9-27.0 per cent. of potassium oxide (actual potash). Besides some 46-50 per cent. of potassium sulphate, it contains over 30 per cent. of magnesium sulphate, chlorine equivalent to 3 per cent. of common salt, a little sodium and calcium sulphates, and varying quantities of moisture.

The two samples analyzed were of average composition.

The cost of potash per pound in double manure salt was 6.1 cents, higher than in high-grade sulphate. In mixed car lots it was bought for 4.9 cents.

MURIATE OF POTASH.

(ANALYSES ON PAGES 33 AND 34.)

Commercial muriate of potash contains about 80 per cent. of muriate of potash (potassium chloride), equivalent to 50.5 per cent. of actual potash, 15 per cent. or more of common salt and 4 per cent. or more of water.

The fourteen samples were of average composition with the exception of **240** which contained an exceptionally high percentage of potash.

The average cost per pound of potash in the muriate was 4.25 cents. In mixed car lots it has been bought for from 3.6 to 3.9 cents per pound.

Sample **481** contained 49.09 per cent. of potash and 50 per cent. is guaranteed.

Two bags weighed respectively 208 and 210 pounds, an average of 209 pounds. Allowing 2 pounds for the bag these bags contained 207 instead of 200 pounds, the marked weight. Now 207 pounds with 49.09 per cent. contain 101.6 pounds of actual potash, whereas 200 pounds with 50 per cent. contain 100 pounds.

This illustrates again the fact that this kind of material may absorb enough water to reduce the *percentage* below guaranty and yet may contain the full *number of pounds* of actual potash which has been guaranteed.

KAINIT.

(ANALYSES ON PAGE 34.)

Kainit contains from 11 to 15 per cent. of potash, more than that quantity of soda, and rather less magnesia. These "bases" are combined with chlorine and sulphuric acid. It usually contains more water than either the sulphate or muriate of potash and is sold on a guaranty of from 12 to 15 per cent. of potash.

Only three samples were examined, which are of average composition.

POTASH SALTS. PERCENTAGE COMPOSITION AND COST PER POUND OF POTASH.

Station No.		Sampled and sent by	Potash soluble in water.		Cost per ton.	Potash costs cents per pound.
			Found.	Guaranteed.		
	High-Grade Sulphate of Potash.					
271	Thos. Griswold, So. Wethersfield, from Coe-Mortimer Co.	Station Agent	49.86	48.0	$48.00	4.8
390	E. C. Hills, Southwick, Mass., from Amer. Agr. Chem. Co.	Purchaser	51.37	48.0	51.00	5.0
531	Wilcox Fertilizer Co., Mystic	Station Agent	51.45	48.0	51.00	5.0
537	Rogers Mfg. Co., Rockfall	Station Agent	50.24	48.0	50.00	5.0
641	C. E. Kempton, Pomfret Center, from F. S. Royster Guano Co., Baltimore	Station Agent	49.73	48.0	51.00	5.1
362	J. F. Merrell, Suffield, from Nitrate Agencies Co.	Station Agent	47.64	48.0	50.00	5.2
482	S. B. Wakeman, Saugatuck, from German Kali Works, Baltimore	Station Agent	48.22	48.0	50.00	5.2
267	Apothecaries Hall Co., Waterbury, from Amer. Agr. Chem. Co.	Station Agent	49.88	48.0	58.00	5.8
542	S. L. Tuttle, Wallingford, from Sanderson Fert. and Chem. Co.	Station Agent	49.12	48.6	.....	....
	Double Sulphate of Potash and Magnesia.					
359	Edmund Halladay, Suffield, from Amer. Agr. Chem. Co.	Station Agent	25.56	26.0	31.00	6.1
185	Conn. School for Boys, Meriden, from Sanderson Fert. and Chem. Co.	Station Agent	27.30	26.0	.....	....
	Muriate of Potash.					
258	A. E. Plant, Branford, from Fertilizer Materials Supply Co.	Purchaser	51.57	50.0	40.00	3.9
280	John Gotta, Portland, from E. Manchester and Sons, Winsted	Purchaser	51.56	49.0	40.40	3.9

POTASH SALTS. PERCENTAGE COMPOSITION AND COST PER POUND OF POTASH.—*Continued.*

Station No.		Sampled and sent by	Potash soluble in water.		Cost per ton.	Potash costs cents per pound.
			Found.	Guaranteed.		
365	J. F. Merrell, Suffield, from Nitrate Agencies Co.	Station Agent	51.56	50.0	$41.00	4.0
532	Wilcox Fertilizer Co., Mystic	Station Agent	52.16	50.0	43.00	4.1
538	Rogers Mfg. Co., Rockfall	Station Agent	51.32	48.0	42.00	4.1
481	S. B. Wakeman, Saugatuck, from German Kali Works, Baltimore	Station Agent	49.09	50.0	41.00	4.2
639	W. S. Morris, Wethersfield and L. A. Gowdy, Somersville, from Coe-Mortimer Co.	Station Agent	50.64	49.0	43.00	4.2
269	F. S. Platt Co., New Haven, from Am. Ag. Chem. Co.	Station Agent	51.42	50.0	44.50	4.3
132	F. S. Platt Co., New Haven, from Am. Ag. Chem. Co.	Purchaser	50.54	50.0	44.50	4.4
273	Lightbourn & Pond Co., New Haven, from L. T. Frisbie Co.	Station Agent	50.53	50.0	46.00	4.6
361	A. D. Bridge's Sons, Hazardville, from Bowker Fertilizer Co.	Station Agent	50.92	49.0	48.00	4.7
184	Conn. School for Boys, Meriden, from Sanderson Fert. and Chem. Co.	Station Agent	49.34	49.0	.....	....
240	C. R. Treat, Orange, from Sanderson Fert. & C. Co.	Station Agent	54.34	49.0	.....	....
262	E. B. Sniffen, Stratford, from Sanderson Fert. & C. Co.	Purchaser	49.18	....	.....	....
	Kainit.					
186	Conn. School for Boys, Meriden, from Sanderson Fert. and Chem. Co.	Station Agent	14.08	12.0	.....	....
536	L. J. Phelps, Colebrook, from German Kali Works, Baltimore	Station Agent	13.35	12.0	.....	....
736	A. S. Stowe, Bethel, from Amer. Agr. Chem. Co.	Station Agent	11.92	12.0	.....	....

VEGETABLE POTASH.

This material, which is understood to be a residue from the beet sugar manufacture, is considerably used as a tobacco fertilizer, most of its potash being in form of carbonate.

A single sample, **738**, from stock of Olds & Whipple, Hartford, had the following composition:

Percentage amounts of	
Potash calculated as muriate	1.53
Potash calculated as sulphate	1.59
Potash calculated as carbonate	23.32
Total water-soluble potash found	26.44
Guaranteed	25.00
Cost per ton	$43.00
Potash costs cents per pound	**8.1**

COTTON BOLL AND COTTON HULL ASHES.

Eight samples of this material, rightly prized as a potash fertilizer on tobacco lands, have been analyzed, as follows:

791. Of light color, sent by L. B. Haas & Co., Hartford.

13. Bought of the Oil Seeds Co., by E. N. Austin, Suffield.

636. Bought of Olds & Whipple, Hartford, by C. W. Porter, Hockanum.

870. Bought of American Cotton Oil Co., by Spencer Bros., Suffield.

887. Bought of American Cotton Oil Co., by Spencer Bros., Suffield.

792. Part of the same shipment as **791**, but darker in color. This sample contained 16.37 per cent. of sand and soil and 11.40 per cent. of coal.

483. Sent by W. M. Hinson, Hazardville.

105. Sent by Huntington Bros., Windsor.

ANALYSES OF COTTON HULL AND COTTON BOLL ASHES.

Station No.	791	13	636	870	887	792	483	105
Percentage amounts of								
Water-soluble potash	22.08	23.40	26.62	21.32	20.82	14.88	23.38	23.39
Cost per ton	$36.00	40.00	55.00	*	*	36.00	.....	.....
Potash costs cents per pound	**8.2**	**8.6**	10.3	**11.2**	**11.2**	**12.1**	.....	.....

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* $2.25 per unit.

The analyses of **791** and **792** show the great inequalities in composition of different packages in the same shipment.

Potash in this form of carbonate has cost from 8.2 to 12.1 cents per pound.

IV. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN AND PHOSPHORIC ACID.

FISH MANURES.

"Fish Scrap," or Dry Ground Fish, as it has been sold in this state for many years, is the dried and ground residue left after expressing the oil from porgies or menhaden. It usually contains 8 per cent. or more of nitrogen and about 7 of phosphoric acid.

Of late there has come into market "dry ground fish" of very different origin and composition from what was previously sold under that name in this state. It is a by-product of factories where fish is prepared for market and does not consist chiefly of the flesh of the fish but is the refuse from the factory, and has considerably less nitrogen and much more phosphoric acid than the dry ground fish from the menhaden oil factories. It contains about 6½ per cent. of nitrogen and 18.00 to 19.00 per cent. of phosphoric acid.

Samples **476**, **156** and **205** represent this material. Four of the fourteen fish manures analyzed do not fully meet their guaranties of nitrogen.

If we allow 3 2-3 cents per pound for the phosphoric acid, the nitrogen in the fish manures costs from 20.3 to 29.1 cents (with one exception, 869, the upper limit is 24.3 cents), and the average of all is 23.4 cents.

No. **474** had less nitrogen than guaranteed. The two single samples from which this sample is made up contained the same percentage, and the manufacturer's chemist in our sample found substantially the same percentage that the Station found.

A second sample, **869**, of this same brand shows a still lower percentage of nitrogen.

SLAUGHTER HOUSE TANKAGE.

(Analyses on pages 38 and 39.)

After boiling or steaming various slaughter-house wastes, fat rises to the surface and is removed, the soup is run off and the settlings remaining in the tanks ("tankage") is dried, ground and sold as a fertilizer.

ANALYSES OF FISH MANURES.

Station No.	Manufacturer and Dealer.	Nitrogen.						Phosphoric Acid.					Cost per ton.	Valuation per ton.	Percentage difference between cost and valuation.
		As Ammonia.	Water-Soluble Organic.	Active Insoluble Organic.	Inactive Insoluble Organic.	Total found.	Total guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total found.	Total guaranteed.			
	FISH MANURES, SAMPLED BY STATION.														
474	American Agr. Chem. Co. Stock of F. J. Hartz, Burnside, and Morris Sullivan, East Windsor Hill	0.44	0.98	4.18	2.23	7.83	8.23	0.56	5.10	2.80	8.46	6.0	$44.25	$39.66	11.6
869	American Agr. Chem. Co. Stock of Broad Brook Lumber Co.	0.70	*	6.21	*	6.91	8.23	0.81	5.02	1.94	7.77	6.0	46.00	35.16	30.8
475	Bowker Fertilizer Co. Stock of C. F. Brewer, Silver Lane, T. J. Coleman, Warehouse Point	0.62	1.15	4.15	2.20	8.12	8.23	0.70	5.57	1.29	7.56	6.0	44.50	40.66	9.4
476	Coe-Mortimer Co. Stock of J. N. Lasbury, Broad Brook	0.12	0.74	3.91	1.49	6.26	6.59	0.40	10.06	9.06	19.52	...	36.00	39.45	8.7†
477	Niantic Menhaden Oil & Guano Co. Stock of F. S. Bidwell & Co., Windsor Locks, and Spencer Bros., Suffield	0.76	2.58	2.99	2.29	8.62	8.25	1.16	4.34	0.97	6.47	6.0	45.00	41.99	7.1
276	Olds & Whipple, sampled from dealer's stock	1.25	1.65	4.79	2.06	9.75	8.20	2.18	4.60	0.59	7.37	6.0	45.00	47.41	5.1†
478	Sanderson Fertzr. & Chem. Co. Stock of C. M. Smith, East Hartford	0.44	1.08	3.67	2.86	8.05	8.2	0.39	4.96	1.42	6.77	6.0	40.85	39.82	2.6
480	Wilcox Fertilizer Co. Sampled at factory	0.18	0.45	6.47	2.20	9.30	8.0	0.51	4.30	1.66	6.47	6.0	44.00	45.28	2.8†
479	Acidulated Fish, Wilcox Fertilizer Co. Sampled at factory	0.80	1.94	2.61	2.79	8.14	7.8	1.42	4.39	0.87	6.68	5.0	41.00	40.08	2.6
713	Acidulated Fish Guano. Niantic Menhaden Oil & Guano Co. Stock of W. W. Gates, Moodus	0.75	0.70	2.09	1.04	4.58	3.3	0.40	3.65	1.25	5.30	3.5	27.00	23.11	16.8
219	Fish Tankage, C. M. Shay Fertilizer Co. Stock of Andrew Ure, Highwood	0.33	3.07	2.03	1.31	6.74	...	...	...	...	9.39	...	....	29.70	...
	FISH MANURES, SAMPLED BY PURCHASER.														
156	Coe-Mortimer Co. Sent by A. E. Potwine, East Windsor	0.13	‡	6.37	‡	6.50	6.61	0.31	11.54	6.65	18.50	...	36.00	36.80	...
205	Coe-Mortimer Co. Sent by Spencer Bros., Suffield	0.11	0.67	4.56	1.04	6.38	6.61	0.36	12.59	6.83	19.78	18.00	40.00	37.31	7.2
266	Sanderson Fertilizer & Chem. Co. Sent by E. B. Sniffen, Stratford	0.50	1.07	5.15	1.80	8.52	8.2	0.60	4.85	1.24	6.69	...	....	41.86	...

* Total organic nitrogen, 6.21. † Valuation exceeds cost. ‡ Total organic nitrogen, 6.37.

ANALYSES OF TANKAGE.

Station No.	Manufacturer.	Dealer or Purchaser.
544	Wilcox Fertilizer Co.	T. H. Eldredge, Norwich
447	Sanderson Fertilizer and Chemical Co.	A. D. Clark, Orange
238	Sanderson Fertilizer and Chemical Co.	C. R. Treat, Orange
218	C. M. Shay Fertilizer Co.	L. M. Benham and S. A. Flight, Highwood
220	Sanderson Fertilizer and Chemical Co.	Agricultural Station
187	Sanderson Fertilizer and Chemical Co.	Conn. School for Boys, Meriden
789	Unknown	S. D. Woodruff & Sons, Orange
540	Sanderson Fertilizer and Chemical Co.	S. L. Tuttle, Wallingford
528	New England Fertilizer Co.	W. E. Fiske, Warehouse Pt., C. N. Burnham, Middlefield
275	L. T. Frisbie Co.	Apothecaries Hall Co., Waterbury
527	American Agricultural Chemical Co.	Pring Bros., Wallingford, E. Halladay, Suffield
278	American Agricultural Chemical Co.	John Gotta, Portland, bought of E. Manchester's Sons

As the analyses show, it has a wide range of composition, depending largely on the relative amounts of bone and of meat scraps which were "rendered" as above, but in general, nitrogen gives more than half the value to the material. Like bone the immediate agricultural value of tankage depends not only on the chemical composition but also on the fineness.

All the samples were drawn by the Station agent excepting **789** and **278**. No. **218** is a "fish tankage." The table of analyses shows the state of solubility of the organic nitrogen. As was explained at length in our last report, by determining the nitrogen solubility, it is possible to distinguish between those forms which are readily available to crops and those which are agriculturally inert.

Water-soluble organic nitrogen is that which is soluble in water under the prescribed method of treatment.

Active insoluble organic nitrogen is insoluble in water, but soluble in an alkaline solution of potassium permanganate.

ANALYSES OF TANKAGE.

Dealer's cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.	Chemical Analysis.								Mechanical Analysis.	
			Nitrogen.						Phosphoric Acid.			
			As Ammonia.	Water-Soluble Organic.	Active Insoluble Organic.	Inactive Insoluble Organic.	Total found.	Total guaranteed.	Found.	Guaranteed.	Finer than 1-50 inch.	Coarser than 1-50 inch.
$34.00	$34.87	2.4*	0.10	0.49	4.72	1.90	7.21	6.6	12.58	10.0	63	37
.....	32.55	...	0.16	3.12	3.10	0.74	7.12	7.4	10.75	...	54	46
.....	31.91	...	0.15	2.90	2.66	1.21	6.92	7.4	10.48	...	58	42
.....	29.21	...	0.32	3.08	2.07	1.24	6.71	...	9.47	...	39	61
.....	31.85	...	0.17	2.72	2.48	1.06	6.43	5.0	13.24	12.0	51	49
.....	32.44	...	0.12	2.27	2.94	1.03	6.38	5.0	13.41	12.0	61	39
.....	27.71	...	0.18	0.48	3.19	2.27	6.12	...	9.43	...	47	53
.....	28.49	...	0.15	2.40	2.20	1.15	5.90	5.7	10.27	10.0	45	55
33.00	29.26	12.7	0.14	2.63	1.75	0.78	5.30	5.0	15.66	14.0	41	59
33.00	30.26	9.0	0.20	2.60	1.52	0.87	5.19	4.9	16.20	15.0	58	42
30.00	27.86	7.6	0.32	1.02	2.22	1.19	4.75	4.9	15.66	13.7	49	51
.....	27.90	...	0.38	0.98	1.92	1.39	4.67	4.9	15.74	13.7	54	46

* Valuation exceeds cost.

Inactive insoluble organic nitrogen is insoluble in either of the above-named reagents.

All of these forms of nitrogen are found in every organic nitrogenous substance, but the relative quantities are quite different. In general, when more than one-half of the water-insoluble organic nitrogen in any mixture is insoluble in permanganate, the conclusion is justified that some agriculturally inferior form is present.

The same may be suspected if no water-soluble nitrogen is present.

The table shows

1. Judged by the solubility of their organic nitrogen, all of the samples appear to be genuine animal tankage of good quality, though a rather high percentage of the nitrogen in 789, from S. D. Woodruff & Sons, is classed as insoluble inactive.

2. Seven of the twelve samples have 50 per cent. or more finer than 1-50 inch. Other things being equal, fine tankage is preferable to

coarse, and there should be no difficulty in getting more than a half of it in the fine condition.

In the schedule of valuations phosphoric acid in fine tankage is rated at 4 cents per pound and in coarse tankage at 3½ cents; figures which cannot be far wrong because the cost and valuation of the samples received are not far apart and an error will be more likely or will count most in the nitrogen valuation, since the market price of it is four or five times as great as that of phosphoric acid.

3. Figured on the above basis the average cost of phosphoric acid in the tankages is 3 3-4 cents, which makes the nitrogen cost from 17 to 20 cents in the samples highest in nitrogen and from 19.2 to 20 cents in the samples relatively low in nitrogen.

Farmers have bought tankage in car lots or mixed car lots, delivered, for prices which brought the cost of nitrogen down to 12.4 to 17 cents per pound.

The two samples **447** and **238** from the Sanderson Fertilizer Co. have somewhat less nitrogen than guaranteed. The company advises us that the stock from which these goods were bagged showed 7.44 per cent. nitrogen.

The two samples from the American Agricultural Chemical Co. also have somewhat less nitrogen than is guaranteed.

EGG TANKAGE.

This material, No. **31**, is stated to be made from the yolks and shells of eggs, the whites being used in some manufacturing process.

"KANONA."

A nitrogenous material, No. **732**, stated to be of animal origin but to contain no leather and to be highly available.

The analyses of these articles are as follows:

	Egg Tankage.	Kanona.
Nitrogen as ammonia	0.06	0.20
" organic, water-soluble	0.37	1.50
" " active insoluble	1.98	5.81
" " inactive insoluble	1.17	1.49
Nitrogen total	3.58	9.00
Phosphoric acid	1.84	....

BONE MANURES.

In the following table are given the chemical and mechanical analyses of thirty-five samples examined this year.

It will be seen that the term "bone" as used in the fertilizer trade has no very precise meaning. The percentage of nitrogen in these bones ranges from 1.6 to 5.58 and phosphoric acid ranges from 14.74 to 28.53.

Some bone manures consist of dry, clean, pure bones, others of fresh or moist bone with more or less adhering grease and flesh, sometimes mixed with sulphate of soda or other salts to prevent putrefaction, or of bone from which a large part of the nitrogenous matter has been extracted in the manufacture of glue.

In buying bone regard should be had to its fineness as well as to its chemical composition. Fine grinding enormously increases the surface upon which the soil bacteria, the soil water and the crop roots can act to dissolve and make available the substance of the bone.

Two samples, **843** and **865**, contained less nitrogen than was guaranteed, but in each case the percentage of phosphoric acid far exceeded the guaranty.

Five samples, **842**, **844**, **854**, **856**, **857**, had less than the guaranteed percentage of phosphoric acid, but in all these cases the excess of nitrogen over the guaranty furnished more than a money equivalent of the deficiency in phosphoric acid.

Lister's Celebrated Ground Bone and Tankage, acidulated, **579**, contains 50 per cent. each of coarse and fine material. It contains:

Nitrogen	2.82
Water-soluble phosphoric acid	5.16
Citrate-soluble phosphoric acid	4.87
Citrate-insoluble phosphoric acid	3.66
Total phosphoric acid	13.69

Its cost is $30 and valuation $19.86.

ANALYSES OF

Station No.	Manufacturer and Brand.	Dealer or Purchaser.
	Sampled by Station Agent:	
839	Amer. Agr. Chem. Co., Fine Ground Bone	J. A. Glasnap
840	Amer. Agr. Chem. Co., Fine Ground Bone	Chas. Templeton
841	Amer. Agr. Chem. Co., Bone Meal	J. A. Glasnap
842	Armour Fertilizer Works, Bone Meal	Farmers' Roofing and Supply Co., A. Grulich
843	Berkshire Fertilizer Co., Fine Ground Bone	Hotchkiss & Templeton
844	Valentine Bohl, Self Recommending Fertilizer.	Apothecaries Hall Co
845	Bowker Fertilizer Co., Fresh Ground Bone	Lightbourn & Pond Co., A. D. Bridge's Sons
846	Bowker Fertilizer Co., Market Bone	J. P. Barstow & Co
847	Buffalo Fertilizer Co., Bone Meal	John Reinhardt & Sons
848	Coe-Mortimer Co., XXX Ground Bone	R. H. Morgan
849	Peter Cooper Fertilizer Co., Pure Bone Dust	Apothecaries Hall Co
850	Essex Fertilizer Co., Ground Bone	W. K. Ackley
851	L. T. Frisbie Co., Fine Bone Meal	D. W. Ives
853	New England Fertilizer Co., Ground Bone	T. B. Atwater
854	Nitrate Agencies Co., Ground Bone	J. R. Houston
856	Rogers & Hubbard Co., Pure Raw Knuckle Bone Flour	H. W. Andrews
857	Rogers & Hubbard Co., Strictly Pure Fine Bone	Warner & Hardin
859	Rogers Mfg. Co., Pure Fine Ground Bone	F. S. Platt Co
858	Rogers Mfg. Co., Pure Knuckle Bone Flour	Factory
855	F.S. Royster Guano Co., Fine Ground Bone Meal	C. E. Kempton
860	Sanderson Fert. & Chem. Co., Ground Bone	F. Hallock Co
861	C. M. Shay Fertilizer Co., Ground Bone	Knowles-Lombard Co
862	M. L. Shoemaker & Co., Swift-Sure Bone Meal	Olds & Whipple
863	Swift's Lowell Fertilizer Co., Ground Bone	M. E. Cooke
864	The Van Iderstine Co., Pure Ground Bone	E. B. Clark Seed Co.
865	Wilcox Fertilizer Co., Pure Ground Bone	T. H. Eldredge
866	Wilcox Fertilizer Co., Ground Steamed Bone	Factory
	Sampled by Purchasers and others:	
259	Fertilizer Materials Supply Co., Steamed Bone.	A. E. Plant
852	E. L. James, Warrenville, Ground Bone	Sent by manufacturer
221	Pittsburg Provision and Pack. Co., Pure Bone Meal	Station
264	Sanderson Fert. and Chem. Co., Fine Ground Bone	E. B. Sniffen
265	Sanderson Fert. and Chem. Co., Fine Ground Bone	E. B. Sniffen
631	Sanderson Fert. and Chem. Co., Fine Ground Bone	O. G. Beard
439	Manufacturer unknown, Ground Bone	Amer. Sumatra Tobacco Co

BONE MANURES.

Dealer's cash price per ton.	Valuation per ton.	Percentage difference between cost and valuation.	Chemical Analysis.				Mechanical Analysis.	
			Nitrogen.		Phosphoric Acid.			
			Found.	Guaranteed.	Found.	Guaranteed.	Finer than 1-50 inch.	Coarser than 1-50 inch.
$35.00	$28.37	23.4	2.52	2.5	26.40	22.0	50	50
35.00	28.19	24.2	2.60	2.5	24.72	22.0	68	32
30.00	18.18	65.0	1.60	1.7	16.84	13.7	53	47
33.00	26.35	25.2	2.66	2.5	22.16	22.5	66	34
32.00	29.83	7.3	2.14	2.5	27.45	20.0	94	6
33.00	32.32	2.1	4.28	3.8	22.03	23.0	72	28
34.00	27.13	25.3	2.75	2.5	23.26	22.8	57	43
30.00	18.98	58.1	2.35	1.9	14.74	13.7	48	52
30.00	29.74	0.8	3.58	2.9	23.33	22.0	51	49
30.00	28.20	6.4	2.42	2.5	25.33	23.0	72	28
30.00	28.48	5.3	2.43	2.1	27.48	22.0	41	59
35.00	30.38	15.2	2.70	2.5	27.12	23.0	67	33
32.00	31.39	1.9	4.01	3.3	23.56	18.0	51	49
34.00	31.64	7.5	2.88	2.5	27.91	23.0	68	32
28.00*	26.59	5.3	2.66	2.5	22.49	22.9	65	35
38.00	32.57	16.7	3.96	3.8	24.03	24.7	69	31
34.50	27.23	26.7	3.60	2.9	20.37	22.0	44	56
38.00	33.18	14.5	3.52	3.0	25.97	22.0	82	18
36.00	34.45	4.5	3.90	3.8	25.59	24.0	81	19
33.00	26.38	25.1	2.41	2.5	23.90	22.9	56	44
33.00	29.63	11.4	2.70	2.5	27.27	20.0	50	50
33.00	28.02	17.8	3.00	1.6	23.92	22.9	47	53
38.00	36.28	4.7	5.58	4.5	22.36	20.0	58	42
31.00	29.54	4.9	2.70	2.5	26.25	23.0	64	36
30.00	28.06	6.9	2.28	2.0	27.58	27.0	42	58
32.00	29.08	10.0	2.32	2.5	28.53	22.0	45	55
29.50	27.49	7.3	2.05	1.6	27.50	24.0	47	53
27.00	.....	....	2.59	2.1	20.64	22.9	73	27
33.00	.....	....	4.01	...	20.85	....	5	95
29.00	.....	....	3.94	...	20.38	....	62	38
.....	.....	....	3.01	2.5	24.78	20.0	48	52
.....	.....	....	2.55	2.5	26.42	20.0	50	50
34.00	.....	....	2.30	2.5	23.44	20.0	41	59
25.00	.....	....	0.74	...	33.10	....	93	7

* Car lot, delivered.

THE COST OF PLANT FOOD IN RAW MATERIALS.

The facts regarding market prices which have been shown in detail in the preceding pages may here be brought together for comparison.

NITROGEN.

The following table gives the percentage of nitrogen, the average retail price and the actual cost of nitrogen both at retail and in mixed car lots of the various nitrogenous raw materials in our market.

	Percentage of Nitrogen.	Cost per ton.	Nitrogen costs cents per pound retail.	Cash cost in mixed car lots.
Nitrate of Soda....	15.5	$50.00	15.9 to 16.7, av. 16.3	14.9 to 15.7
Dried Blood......	13.0	.....	....	20.6
Cotton Seed Meal.	6.0 to 7.6	31.50	17.4 to 25.5, av. 20.2‡	20.2
Castor Pomace....	4.5 to 5.2	25.00	22.3 to 25.9, av. 24.6	....
Linseed Meal.....	5.3	.....	....	....
Dry Ground Fish..	8.5*	43.50	20.3 to 24.2, av. 22.5	....
Tankage	4.7 to 7.2†	30 to 34	17 to 20	12.4 to 17.0

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* And 7.1 per cent. of phosphoric acid. † And 9.4–16.2 per cent. of phosphoric acid. ‡ In car lots.

The table shows that in general nitrogen in castor pomace has cost more than in other forms, 24.6 cents per pound, and that of dry ground fish comes next, 22.5. The nitrogen of tankage and cotton seed meal has been bought at about the same price and that of nitrate of soda has been much cheaper than in any other of these forms, costing a fifth less. Being cheaper and more quickly available than other forms, it should be used wherever it can be with advantage. For top dressing winter grains and meadows, as a "starter" for potatoes and other early planted crops, and in orchards it deserves more general use.

PHOSPHORIC ACID.

	Percentage of Phosphoric Acid.	Citrate-Soluble.	Cost per ton.	Citrate-Soluble costs cents per pound, retail.	Cash cost in mixed car lots.
Ground Phosphate Rock	25.4	....	$10.30*	2.0†	1¼†
Basic Slag..........	17.0	15.7	15 to 18	5.1	4.1 to 4.8
Precipitated Bone...	38.0	35.8 to 38.6	....	5.0	....
Acid Phosphate	15 to 17	13.8 to 15.9	14.50 to 17.75	4.9 to 6.4, av. 5.3	3.6 to 4.4

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* Car lots, bags. † Cost of *total* phosphoric acid.

This table includes the chief commercial sources of phosphoric acid, excepting bone. Insoluble and comparatively inert phosphoric acid costs in car lots less than two cents a pound. Citrate-soluble phosphoric acid either in basic slag, precipitated bone, or acid phosphate, costs about 5 cents at retail but in mixed car lots can be bought for cash for a cent less. In selecting it must be remembered that "precipitated bone" is neutral in reaction and is specially used as a tobacco fertilizer; basic slag is strongly alkaline, containing from 40-50 per cent. of lime, a part of which is probably uncombined with phosphoric acid, while acid phosphate is strongly acid in reaction, and may contain some free sulphuric acid and also a large amount of sulphate of lime, land plaster. It has been pointed out by others that sulphate of lime, like many other salts, may act on some soils as a potash fertilizer, its lime displacing potash from certain hydrous silicates, zeolites, and making it more quickly available to crops.

POTASH.

	Percentage of Potash.	Cost per ton.	Potash costs cents per pound retail.	Cash cost in mixed car lots.
High-grade Sulphate........	49 to 51	$48 to 51	5	5.0
Low-grade Sulphate........	25.5 to 27.7	31	6.1	4.9
Muriate....................	49 to 52.1	40 to 48	3.9 to 4.6	3.6 to 3.9
Kainit.....................	11.2 to 14.0	....	....	3.9
Vegetable Potash (carbonate)	26.4	43.00	8.1	....
Cotton Hull Ashes.........	22 to 26.6	36 to 55	8.2 to 11.2	....

The above figures show that potash in form of carbonate costs fully three cents more per pound than in any other form. It has been a favorite form of potash for tobacco and some lands have unquestionably been overdosed with it.

Our own experiments at Poquonock indicated a somewhat unfavorable effect on the burn of the tobacco leaf when sulphate of potash was used, but many growers have used it without causing any such defect. In our tests unnecessarily large quantities of sulphate were used. On old tobacco land, 300 pounds of high-grade sulphate of potash should certainly be enough. Some fruit growers prefer either the high grade or double sulphate of potash for orchard fertilizers, believing that where it is used the color of the fruit is better than where the cheaper muriate is substituted. Whether this is generally true is quite uncertain.

Our observation and experience make very clear the extreme importance of coöperative buying for cash where this can possibly be done. A much larger part of the fertilizers used in Connecticut could be bought in car lots than is now done with a saving of 10 per cent. or more in their cost.

V. MIXED FERTILIZERS.

MIXTURES OF PHOSPHATES WITH POTASH SALTS.

733. Grass and Oats Fertilizer, made by American Agricultural Chemical Co., New York City; sampled from stock of C. A. Cowles, Plantsville.

734. Wheeler's Grass and Oats, made by American Agricultural Chemical Co., New York City; sampled from stock of L. L. Loomis, East Granby.

348. A mixture claimed by the manufacturer to be two-thirds by weight of acid phosphate and one-third high-grade sulphate of potash, 52 per cent. Sent by R. S. Rounds, Cannon Station.

	733	734	348
Water-soluble phosphoric acid	9.47	9.22	.....
Citrate-soluble phosphoric acid	2.52	1.72	.....
Citrate-insoluble phosphoric acid	0.61	0.20	.....
Total phosphoric acid found	12.60	11.14	.....
" " " guaranteed	12.00	12.00	.....
Water-soluble potash found	2.25	2.17	13.64
Potash guaranteed	2.00	2.00	.....
Cost per ton	$25.00	$23.00	.....
Valuation per ton	$12.69	$11.60	.....
Percentage difference between cost and valuation	97.00	98.3	.....

1575 pounds of acid phosphate and 90 pounds of muriate of potash contain as much plant food as either of the above grass mixtures and can be readily bought anywhere in the state for about $14.50 and usually for considerably less.

The percentage of potash in **348** indicates that only about one-fourth of the mixture was 52 per cent. high-grade sulphate of potash.

NITROGENOUS SUPERPHOSPHATES.

(ANALYSES ON PAGES 58 TO 83.)

In the following table are 273 analyses of samples of nitrogenous superphosphates which were drawn by the Station agent, and eight analyses of samples sent by individuals. The brands are given under the names of their manufacturers, arranged alphabetically.

All of the determinations are made in duplicate by expert chemists, are frequently checked by chemists elsewhere, and we have every reason to believe, are correct. We may assume a possible error not greater than 0.1 per cent. of nitrogen and 0.15 per cent. of phosphoric acid and potash, due to errors of analysis.

Whether the samples accurately represent the average composition of the brands is less certain. At least three packages of each brand are sampled with an instrument which takes a section of the contents from top to bottom. Often a considerably larger number are thus sampled, and the analysis is made on a mixture of these separate samples. Frequently samples of a given brand are drawn as above described in several different towns, and these samples are mixed and analyzed as one sample.

Nevertheless, as will appear on following pages, the analysis in some cases is unsatisfactory to the manufacturer, who claims that it does not represent fairly the average quality of the brand in question. Analyses of the same brand made on samples drawn in other states or on samples drawn from the factory pile from which the shipment was made, show results quite different from our own.

The causes of these discrepancies, irritating alike to the manufacturer and to the Station, are various. Some are quite evident and others are probably not understood. A mixture of dry materials which have very different specific weights always separates more or less when it is moved or shaken either in the pile or in the bags. In a pile of such a mixture the coarser and heavier particles will be found around the outside edge of the heap, and goods bagged from this part will not have the same composition as from other parts of the pile.

When fertilizer bags are torn in handling, the dealer must rebag their contents, and he uses what sacks he may have at hand. If they are stenciled with the name of a different brand, confusion is likely to result. In some cases it has been quite clear that this has happened, and any shortage of weight had been made good by fertilizer sweepings. If one such bag is among those which are sampled, of course the analysis will be misleading.

The differences between the analyses made by the manufacturers and those made in the course of fertilizer inspection are almost invariably due to differences in sample and not to errors of analysis. Differences in sample may be attributed to three or four causes, loss or gain of moisture, lack of uniformity in the different packages, mistakes in brands or tags, and faulty method of sampling. The last of these alone is the responsibility of the Station. Every effort is made by it to follow a method which will give a perfectly representative sample of the packages opened and of the whole stock, provided that they are reasonably uniform in composition. Each analysis is reported as soon as done to the persons owning the stock, and also to the manufacturer. If the analysis does not in his view represent the goods fairly, the Station has, wherever it could be done, drawn and tested other samples of the brand. It cannot, however, suppress any analysis which it has made.

The water-solubility of the organic nitrogen has been determined in all cases, and where this was suspiciously low, both the active- and inactive-insoluble nitrogen have been determined. Experience indicates that when there is a fair proportion of water-soluble organic nitrogen, no undue proportion of inactive-insoluble nitrogen will be present.

When more than one-half of the organic nitrogen is classed as inactive-insoluble, it indicates that inferior forms of nitrogen have been used, in part at least, and if after deducting the inactive-insoluble nitrogen from the percentage of total nitrogen found, the remainder is not as much as the guaranty, it cannot be fairly claimed that the goods are as guaranteed.

The brands are discussed in what follows in the order in which they are tabulated.

American Agricultural Chemical Co.

510. Complete Tobacco Manure shows an overrun of 0.40 per cent. nitrogen and 1.84 available phosphoric acid, and a deficiency of 0.80 per cent. potash. The manufacturer asked that another sample be drawn, which was done.

Its analysis, **720**, shows about the same nitrogen as **510**, available phosphoric acid 5.20 instead of 4.84, but potash 5.81 instead of 4.70.

721. Complete Tobacco Manure from Carbonate having shown a deficiency of 0.33 per cent. of potash, a second sample, **867**, was analyzed in which the potash was well above the guaranty.

819. H. G. Tobacco Manure. The nitrogen is 0.80 and the potash 0.85 per cent. below guaranty. There is an overrun of 1.32 per cent. in available phosphoric acid.

A sample drawn in another place, **895**, showed a deficiency of only 0.18 per cent. of nitrogen, while available phosphoric acid was 1.7 and potash 0.15 above guaranty.

695. Packer's Union Gardener's Complete Manure showed an overrun of 0.17 per cent. nitrogen and 0.36 available phosphoric acid, and a deficiency of 0.71 potash. Another sample subsequently drawn, **825**, showed an overrun of 0.18 nitrogen and 1.69 available phosphoric acid, and a deficiency of 1.82 per cent. of potash.

Of the forty-four brands of the American Agricultural Chemical Company's fertilizers which we examined (forty-eight analyses), the nitrogen in three cases, potash in eleven cases, and both nitrogen and potash in one case, are below the guaranty. In all but one case the deficiency in one ingredient is fully made up in money-value by an overrun of the others. The single case is **819**, H. G. Tobacco Manure, which shows a money deficiency of $2.70. The second sample, above referred to, however, shows no such deficiency.

The solubility of the nitrogen in all the samples examined is satisfactory.

Armour Fertilizer Works.

369. Bidwell's Formula for all Crops. The nitrogen was 0.45 per cent. and potash 0.41 per cent. below guaranty and available phosphoric acid 0.29 per cent. above guaranty. On request, a second sample was drawn and analyzed, **516**, in which the nitrogen was 0.18 per cent. and potash 0.39 per cent. below, and available phosphoric acid 0.16 above guaranty.

Of the twelve samples (eleven brands) analyzed, two are below guaranty in both nitrogen and potash, one each in nitrogen, potash and available phosphoric acid. In two cases the deficiency of one or more ingredients is not made good in money-value by an overrun in the other, the deficit being $1.82 per ton in **369** and $0.88 in **516**, both being Bidwell's Formula for all Crops.

If the inactive-insoluble nitrogen in Brewer's Special Tobacco Fertilizer is deducted from the total nitrogen, the remainder, active nitrogen, falls 1.57 per cent. below the guaranty.

Berkshire Fertilizer Co. All of the six brands meet their guaranties and the nitrogen solubility is satisfactory.

F. E. Boardman. **309.** Complete Fertilizer. The available phosphoric acid is 0.38 per cent. below guaranty, but the deficiency is more than made good by the overrun of nitrogen.

Bowker Fertilizer Co. Bowker's Complete Alkaline Tobacco Grower (with potash as carbonate), **730,** had 0.91 per cent. less potash than guaranteed and .08 per cent. nitrogen and 2.09 per cent. available phosphoric acid more than guaranteed. A second sample, **868,** was drawn by thoroughly mixing the contents of four bags on the floor and sampling this mixture. It contained 0.14 more nitrogen, 1.03 more of available phosphoric acid and 1.22 per cent. more potash than was guaranteed.

Stockbridge Potato and Vegetable Manure, **285,** contained 1.04 per cent. more available phosphoric acid than guaranteed, but 0.7 per cent. less of potash. Upon request a second sample, **432,** was drawn and examined. This sample contained 0.70 more available phosphoric acid and 0.61 per cent. less potash than the guaranty, the two samples having approximately the same composition. Each of the three samples, of which **285** is a mixture, was separately tested for potash and contained 8.97, 9.27 and 9.76 per cent. respectively.

The manufacturer advises that a sample drawn from stock of W. B. Rice, Meriden, by their agent, who mixed the contents of four bags and sampled this mixture, contained 10 per cent. of potash.

Stockbridge Special Complete Manure for Tobacco, **742,** contained 2.34 per cent. less of nitrogen and 0.82 per cent. more of available phosphoric acid and 2.45 per cent. more of potash than was guaranteed. Such wide differences strongly suggest a confusion of brands and that the material sampled was not representative of the brand named.

A second sample, **896**, was therefore drawn and analyzed, which showed 0.48 per cent. of nitrogen and 0.17 per cent. of potash less than guaranteed and 1.79 per cent. overrun of available phosphoric acid.

Of the twenty-three analyses of the Bowker Fertilizer Co.'s goods (twenty brands), eleven are below guaranty; two in nitrogen, one in phosphoric acid, one in both nitrogen and potash and seven in potash. In every case, however, the deficiency in one ingredient is fully made good, in respect of money value, by an excess over guaranty in the other ingredients.

Buffalo Fertilizer Co. The sample of Celery and Potato Special, **290**, showed nitrogen 0.25 per cent. and available phosphoric acid 0.48 per cent. in excess of guaranty but potash 1.29 per cent. below guaranty. The solubility of the nitrogen was also low. At the request of the manufacturer—who stated that repeated analyses of the pile from which this brand was shipped had shown in every case more than 10 per cent. of potash—another sample was drawn by the Station agent, **467**, which gave 0.62 per cent. of available phosphoric acid and 0.21 per cent. of potash in excess of guaranty.

Potash was also separately determined in the three individual samples which were mixed to make up **290**, and there was found respectively 7.16, 9.22, and 10.24 per cent. The lowest percentage was in the sample drawn of John Reinhardt & Sons, W. Cheshire.

Three of the nine brands sold by this company did not have the full amounts of plant food guaranteed, two being deficient in potash and one in nitrogen, but in all but one, **698**, a deficiency of one ingredient is made good, as far as money equivalent is concerned, by excess of other ingredients. In this one case the money equivalent of the deficiency is about $1.70 per ton.

If the inactive, insoluble nitrogen in Buffalo Tobacco Producer is deducted from the total nitrogen, the remainder is 1.15 per cent. short of the amount guaranteed; that is, the guaranteed amount of nitrogen is not fully supplied in active forms.

Chittenden Fertilizer Co.'s Tobacco Grower. **624.** The sample was drawn from two agents in Broad Brook and one in Windsorville. The nitrogen found was less than the amount guaranteed by 0.20 per cent., while the available phosphoric acid exceeded the guaranty by 0.44 per cent. and potash by 2.81 per cent. The manufacturer stated that the goods shipped to one of the agents were all from one car, every tenth bag had been sampled and analysis of the mixed sample by a Baltimore commercial chemist gave, nitrogen 4.96, available phosphoric acid 4.32, potash 8.85 per cent. The manufacturer further stated that both of the other Connecticut agents had only goods from another single car which was sampled as above described and a mixture of samples from this car and several others loaded from the same stock showed nitrogen 5.01, available phosphoric acid 4.65, potash 8.65 per cent., figures which differ slightly from analysis **624** in nitrogen and phosphoric acid but very widely differ as to potash.

In view of these facts, the manufacturer requested careful review of all the work, asserting that the Station analysis did not represent the quality of the goods.

In each of the three samples of which **624** is made up, nitrogen was determined, and the following percentages found, 4.66, 4.81, 4.93; average, 4.80, the same figure reported in **624.** The figures indicate no very great difference in the composition of the samples. Our sampling agent endeavored, but was not able, after the request was made, to find this brand in hands of agents and so we were unable to make further analyses. The chemists above referred to, Wiley & Co., kindly forwarded portions of their samples, which were examined at this Station. The results were substantially the same as those obtained by the manufacturer's chemist, the Station figures for potash being slightly higher.

Two of the eight brands of the E. D. Chittenden Co. do not fully meet their guaranty in all particulars, one being deficient in nitrogen and one in potash, but in each case the excess over guaranty of other ingredients much more than makes good the money value of the deficiency in one.

The E. B. Clark Co.'s brands meet their guaranties in all respects.

The Coe-Mortimer Co.'s Complete Manure with ten per cent. of potash, sample **471**, contained 1.86 per cent. more of available phosphoric acid than was guaranteed and 0.21 per cent. less of potash. The three samples from which **471** was prepared contained respectively 9.65, 9.91 and 9.81 per cent. of potash.

Coe-Mortimer's Peruvian Tobacco Fertilizer, **618**, showed a deficiency of 0.44 per cent. of nitrogen and 0.38 per cent. of potash and an overrun of 1.28 per cent. of available phosphoric acid.

Coe-Mortimer's Vegetable Grower, sample **752**, showed a deficiency of 0.57 per cent. of potash and an overrun of available phosphoric acid of the same amount.

In these three cases a part of our sample was sent to the company to check our work and an unsuccessful effort made to draw other samples from the market for analysis.

Of the nine brands sold by this company three show deficiency of potash and one of both nitrogen and potash. In **618** and **752** the money equivalent of these deficiencies is not fully compensated by an overrun of other ingredients.

The Connecticut Valley Orchard Co.'s Special Fertilizer and the two brands of *T. H. Eldredge's* goods contain the guaranteed amounts of plant food.

Three brands of the *Essex Fertilizer Co.'s* goods show small deficiencies of nitrogen, this being more than made good in money equivalent by an overrun of the other ingredients.

The Fertilizer Materials Supply Co.'s No. 1 Potato and General Truck, sample **452**, shows a deficiency of 0.56 per cent. of potash, a very slight deficiency of nitrogen and an excess over guaranty of 0.48 per cent. of available phosphoric acid, which does not quite make good in money equivalent the other deficiencies.

The L. T. Frisbie Co.'s Connecticut Special Fertilizer, sample **312**, having shown a deficiency of 0.29 per cent. potash, a second sample, **468**, was tested, and showed a deficiency of 0.16 per cent. of nitrogen, 0.12 available phosphoric acid and 0.97 per cent. of potash.

Frisbie's Corn and Grain Fertilizer, sample **294**, showed a deficiency of 0.24 per cent. potash, with an excess of 0.38 per cent. nitrogen and 1.52 per cent. available phosphoric acid. The manufacturer stated that analyses of this brand in bulk had shown 3.07 per cent. of potash. Potash determined separately in the three samples of which **294** was made up showed 2.72, 2.89 and 2.70 respectively. A second sample, **451**, was also taken, from stock of Lightbourn & Pond, the analysis of which met the guaranty in all respects.

Of the five brands of this company, two were deficient in potash and one in nitrogen and potash. In one case, **468**, the money equivalent of the guaranty was deficient by $1.51.

Lister's Agricultural Chemical Works. All of the ten brands fully meet their guaranties, with exception of a deficiency in available phosphoric acid of 0.58 per cent. in **771**, which is more than compensated by an overrun in the other ingredients.

E. Manchester & Sons' Manchester's Formula, sample **625**, shows a deficiency of 0.70 per cent. of potash and an overrun of available phosphoric acid of 0.92 per cent. A second sample, **805**, shows a deficiency of nitrogen of 0.30 and of potash of 0.42 per cent., with an overrun of available phosphoric acid of 0.61 per cent. At the urgent request of the manufacturer, a third sample was drawn and analyzed, **913**, which showed a deficiency of 0.32 per cent. of nitrogen with an overrun of 0.62 of available phosphoric acid and 0.13 of potash.

Manchester's Special, sample **765**, shows a deficiency of 0.36 per cent. nitrogen, 1.72 per cent. of potash and an overrun of 0.4 per cent. available phosphoric acid.

Of the five analyses, three brands, one is deficient in potash, one in nitrogen and two are deficient in both nitrogen and potash.

Two analyses, **805** and **765**, show a deficiency of money value in plant food of $1.00 and $2.49 respectively.

Mapes Formula and Peruvian Guano Co.'s fifteen brands all fully meet their guaranties, with the exception of **553**, in which a deficiency of 0.37 per cent. of potash is fully offset by an overrun of 0.7 per cent. nitrogen.

The National Fertilizer Co.'s Eureka Potato Fertilizer, sample **585**, taken from three different places and from nineteen packages, showed a deficiency of 0.92 per cent. of potash with an overrun of 0.11 per cent. nitrogen and 0.51 per cent. available phosphoric acid. The manufacturer tested a portion of our sample, corroborating our result on potash and asked that a second sample be drawn. This second sample, **793**, drawn from seven bags, showed a deficiency of 1.85 per cent. potash and an overrun of 0.32 per cent. nitrogen and 1.15 per cent. available phosphoric acid.

Of the fourteen analyses (twelve brands) of this company four are deficient in nitrogen and four in potash. In one case, **556**, the deficiency is not made good in money value by the excess of other ingredients, this difference amounting to about eighty-seven cents.

Of *The New England Fertilizer Co.'s* seven brands, two are deficient in potash and one in nitrogen, and in each case the deficiency is made good by an excess of the other ingredients.

Of the *Niantic Menhaden Fish Oil & Guano Co.'s* five brands one is deficient in nitrogen but this is more than made good by an excess of the other ingredients.

Olds & Whipple's seven brands fully meet their guaranties with the exception of **277**, where a small deficiency in available phosphoric acid is compensated by a large overrun of potash.

Of the five brands of *Parmenter & Polsey,* three are somewhat deficient in potash and one is deficient in nitrogen, with a slight overrun of some other ingredient.

The F. S. Platt Co.'s Market Garden Phosphate fully meets its guaranty.

The Rogers & Hubbard Co.'s Bone Base Soluble Tobacco Manure, sample **588**, shows 1.05 per cent. of chlorine. The manufacturers asked for a re-test, as only high-grade sulphate of potash was used in this brand. The percentage of chlorine was found to be the same in each of the samples of which **588** was made up. Even the high-grade sulphate of potash contains a trace or more of chlorine and it is likely to be found in small amount in nitrogenous materials. One per cent. of chlorine in a tobacco fertilizer is absolutely without effect on the quality of the crop. It amounts to twenty pounds per acre, if a ton of the fertilizer is used. An ordinary dressing of stable manure, which is used everywhere and everywhere acknowledged as one of the best tobacco fertilizers, contains a good deal more chlorine than this. Most growers are too particular about chlorine. More attention to lack of lime and less to presence of chlorine in their fertilizers would be worth while. In this fertilizer there is a slight deficiency of potash fully compensated in money value by an overrun in the other ingredients. The other seven brands fully meet their guaranties in all particulars.

The eleven brands of the *Rogers Manufacturing Co.* fully meet their guaranties, excepting **735**, in which a deficiency of potash of 0.50 per cent. is fully compensated in money value by an excess of phosphoric acid.

Royster's High-Grade Tobacco Manure, sample **628**, shows a deficiency of 1.3 per cent. potash and 0.56 per cent. nitrogen and an overrun of 2.65 per cent. available phosphoric acid. The manufacturer protested that the goods were made with safe overruns of each ingredient and that the above sample was certainly not representative and requested the analysis of another sample. Our agent tried unsuccessfully to find other stock of this brand in the State. Tests of nitrogen in the three samples, of which **628** is a mixture, gave 3.95, 4.16 and 4.72 per cent., a wide difference, but in no case meeting the guaranty.

The analysis of Royster's Tobacco Ash Components, sample **660**, was protested by the manufacturer because, while only high-grade sulphate was used in its manufacture, the analysis showed over 10 per cent. of chlorine.

With the above exceptions the nine brands of this company's manufacture fully met their guaranties.

The nine brands of the *Sanderson Fertilizer and Chemical Co.* fully meet their guaranties in all respects.

One of the brands of the *C. M. Shay Fertilizer Co.*, **569**, shows a deficiency of 0.23 per cent. potash but an overrun of 0.48 per cent. of nitrogen, which more than compensates in money equivalent. Another, **645**, is deficient in available phosphoric acid with an overrun of the other ingredients.

The nitrogen in one of *M. L. Shoemaker & Co.'s* brands, **808**, is 0.23 below guaranty, compensated in money equivalent by an overrun in available phosphoric acid.

Of the thirteen brands of the *Swift-Lowell Fertilizer Co.*, four are deficient in nitrogen and two in potash, but the excess of other ingredients over guaranty makes good the money equivalent of the deficient elements.

One of the two brands of *Tanner & Wilcox* is deficient in available phosphoric acid, but this is compensated by an excess of 0.61 per cent. of nitrogen.

All of the ten brands of the *Wilcox Fertilizer Co.* fully meet their guaranties.

S. D. Woodruff & Sons' Home Mixture, **348**, exceeds the guaranteed potash by 0.27 per cent. and the guaranteed nitrogen by 0.43 per cent. This nitrogen, however, has a lower solubility than that of any other sample examined. If the insoluble-inactive nitrogen is deducted, the amount of active organic nitrogen is less than the guaranty by 0.59 per cent.

Summary regarding Guaranties.

Of the 273 analyses representing 258 brands, eighty-one show deficiencies in respect of one or more ingredients; thus twenty-two are deficient in nitrogen, five in "available" phosphoric acid, forty-three in potash and eleven others in both potash and nitrogen or potash and phosphoric acid.

In twelve cases these deficiencies are not fully compensated by an overrun of the other ingredients, so that the goods neither contain what they are guaranteed to contain, nor its fair equivalent.

COST.

The cash retail price is quoted by each agent from whom a sample is drawn and these prices are reported to manufacturers for criticism. If quotations on a given brand are widely divergent the dealers are asked to confirm or correct the figures. The average of the several quotations is given in the table.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	The American Agricultural Chemical Co., New York City.				
426	Complete Manure with 10% Potash	Meriden, Milford, Burnside	$38.00	$25.89	46.8
510*	Complete Tobacco Manure (from Sulphate)	East Windsor Hill, Burnside	36.00	28.02	28.4
720	Complete Tobacco Manure (from Sulphate)	Broad Brook, So. Manchester	36.00	29.28	22.9
721†	Complete Tobacco Manure (from Carbonate)	So. Manchester	37.00	29.90	23.7
867	Complete Tobacco Manure (from Carbonate)	Hillstown	37.00	29.66	24.7
366	Grass and Lawn Top Dressing	New Haven, Meriden, Milford	33.50	20.54	63.0
650	H. G. Fertilizer, 10% Potash	Rockville, Putnam	38.00	22.98	65.4
819†	H. G. Tobacco Manure	Broad Brook	48.00	32.29	48.7
895	H. G. Tobacco Manure	Windsor	48.00	36.21	32.5
693	Tobacco Starter and Grower	Broad Brook, New Milford	38.00	24.32	56.3
	Bradley Branch:				
651	Complete Manure for Potatoes and Vegetables	Norwich Town, Milford	36.50	26.68	36.8
652	Complete Manure for Top Dressing, Grass and Grain	Hazardville, East Windsor Hill	38.75	27.39	41.5
378	Corn Phosphate	Rockville, Norwich Town, Milford	29.50	16.99	73.7
653	Eclipse Phosphate	Milford, Putnam	27.50	14.14	94.5
558	Farmers' New Method Fertilizer	Middletown, Putnam, Stafford Springs	30.00	17.35	72.9
820	Niagara Phosphate	Milford, Putnam	26.50	12.53	111.5
821	Potato Fertilizer	Middletown, Putnam	30.50	17.60	73.3
379	Potato Manure	Rockville, Norwich Town, Milford	32.00	19.26	66.1
427	XL Superphosphate	Suffield, Norwich Town, Burnside	33.25	20.03	66.0
	Church Branch:				
308	Fish and Potash	Wallingford, Hazardville, Meriden	26.75	17.07	56.7

* See note, p. 48. † See note, p. 49.

ANALYSES AND VALUATIONS.

Nitrogen.						Phosphoric Acid.							Potash.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.04	1.65	0.28	1.23	3.20	3.3	5.44	1.34	0.68	7.46	7.0	6.78	6.0	9.80	10.0	426
0.29	0.16	0.51	3.99	4.95	4.5	1.08	3.76	1.62	6.46	4.0	4.84	3.0	[1]4.70	5.5	510
....	0.95	0.82	3.21	4.98	4.5	1.15	4.05	1.62	6.82	4.0	5.20	3.0	[2]5.81	5.5	720
0.20	0.05	1.06	3.36	4.67	4.5	0.18	5.78	2.29	8.25	4.0	5.96	3.0	[3]5.17	5.5	721
0.37	0.03	4.25		4.65	4.5	0.59	3.38	1.48	5.45	4.0	3.97	3.0	[4]5.92	5.5	867
2.25	0.15	0.26	1.18	3.84	3.9	2.92	2.75	1.19	6.86	6.0	5.67	5.0	2.15	2.0	366
0.59	0.86	0.22	0.76	2.43	2.5	4.25	2.46	1.29	8.00	7.0	6.71	6.0	9.59	10.0	650
0.17	3.04	0.28	1.51	5.00	5.8	4.46	1.86	0.74	7.06	6.0	6.32	5.0	[5]9.15	10.0	819
0.13	3.10	2.39		5.62	5.8	4.82	1.88	0.52	7.22	6.0	6.70	5.0	[6]10.15	10.0	895
....	2.14	0.30	0.93	3.37	3.3	7.63	1.23	0.57	9.43	9.0	8.86	8.0	[7]4.45	4.0	693
0.93	0.63	0.52	1.23	3.31	3.3	5.13	4.13	2.24	11.50	9.0	9.26	8.0	7.13	7.0	651
1.24	1.01	0.22	2.38	4.85	4.9	3.24	2.24	1.04	6.52	5.0	5.48	4.0	5.83	6.0	652
0.50	0.51	0.26	0.85	2.12	2.1	5.17	3.31	1.50	9.98	9.0	8.48	8.0	1.81	1.5	378
0.12	0.23	0.32	0.56	1.23	1.0	5.42	2.62	1.06	9.10	9.0	8.04	8.0	2.63	2.0	653
0.31	0.58	0.27	0.77	1.93	1.7	5.53	2.69	1.43	9.65	9.0	8.22	8.0	3.26	3.0	558
0.13	0.34	0.18	0.55	1.20	0.8	5.12	2.45	0.91	8.48	8.0	7.57	7.0	1.50	1.0	820
0.11	1.05	0.16	0.72	2.04	2.1	5.75	2.74	1.05	9.54	9.0	8.49	8.0	3.11	3.0	821
0.42	0.98	0.26	0.76	2.42	2.5	4.48	2.45	1.78	8.71	7.0	6.93	6.0	4.78	5.0	379
0.58	0.44	0.30	1.10	2.42	2.5	7.01	3.04	1.51	11.56	10.0	10.05	9.0	2.37	2.0	427
0.10	0.35	0.34	1.44	2.23	2.1	3.69	3.12	2.03	8.84	7.0	6.81	6.0	2.58	2.0	308

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[1] 0.70% potash as muriate, 4.00% as sulphate.

[2] 1.00% potash as muriate, 4.81% as sulphate.

[3] 1.00% potash as muriate, 1.73% as sulphate, 2.44% as carbonate.

[4] 0.60% potash as muriate, 1.19% as sulphate, 4.13% as carbonate.

[5] 2.50% potash as muriate, 6.65% as sulphate.

[6] 1.20% potash as muriate, 8.95% as sulphate.

[7] 0.82% potash as muriate, 3.63% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	Great Eastern Branch:				
654	General	Madison, New Canaan	$28.00	$14.76	89.7
559	H. G. Vegetable, Vine and Tobacco Fertilizer	Colebrook, East Hampton, Madison	33.75	20.76	62.6
822	Northern Corn Special	East Hampton, No. Granby	32.00	19.53	63.8
	Northwestern Branch:				
283	Fish, Bone and Potash	New Haven, Suffield, Hazardville	30.00	19.36	54.9
511	Market Garden Phosphate	Southport, Stamford	33.50	22.08	51.7
512	10% Potato Fertilizer	Wallingford, Hazardville	33.50	23.40	43.2
824	Universal Fertilizer	New Canaan	38.00	20.43	86.0
	Packers' Union Branch:				
694	Animal Corn Fertilizer	Waterford, Middlebury	33.50	19.07	75.7
695*	Gardeners' Complete Manure	New Canaan, Middlebury	37.00	25.02	47.8
825	Gardeners' Complete Manure	Watertown	37.00	25.23	46.7
501	Potato Manure	Waterford, Ellington, East Hampton	32.25	20.47	57.5
	Quinnipiac Branch:				
560	Climax Phosphate	Milford, Plainfield, Danielson	29.25	13.96	109.5
498	Corn Manure	Wallingford, Westport	31.00	17.40	78.2
696	Market Garden Manure	Milford, Southport	37.00	25.77	43.6
823	Phosphate	Putnam, New London	32.50	19.77	64.4
380	Potato Manure	Wallingford, New London, Westport	32.75	19.79	65.5
381	Potato Phosphate	Wallingford, New London, Westport	32.00	18.58	72.2
	Read Branch:				
620	Practical Potato Special	Westport, East Hampton, Plantsville	32.00	16.00	100.0
827	Standard Superphosphate	Bristol, So. Meriden, E. Canaan	29.25	14.93	95.9
826	Vegetable and Vine Fertilizer	Bristol, So. Meriden	33.00	20.46	61.3
	Wheeler Branch:				
621	Corn Fertilizer	E. Granby, Riverton, No. Granby	29.75	16.51	80.2
655	Havana Tobacco Grower	E. Granby, Riverton, No. Granby	36.25	25.63	41.4
622	Potato Manure	E. Granby, Riverton, No. Granby	30.75	18.28	68.2

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* See note, p. 49.

ANALYSES AND VALUATIONS—*Continued.*

Nitrogen.						Phosphoric Acid.							Potash.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.07	0.12	0.18	0.58	0.95	0.8	5.95	2.56	0.96	9.47	9.0	8.51	8.0	4.06	4.0	654
0.40	0.25	0.31	1.09	2.05	2.1	6.81	2.04	0.82	9.67	9.0	8.85	8.0	6.12	6.0	559
0.09	0.93	0.33	1.07	2.42	2.5	5.65	3.65	1.19	10.49	10.0	9.30	9.0	2.77	2.0	822
0.12	0.45	0.38	1.75	2.70	2.5	3.03	2.80	1.42	7.25	5.0	5.83	4.0	4.52	4.0	283
0.31	0.88	0.26	1.13	2.58	2.5	6.33	2.23	0.82	9.38	9.0	8.56	8.0	5.97	6.0	511
0.54	0.10	0.34	0.80	1.78	1.7	6.78	2.03	1.02	9.83	9.0	8.81	8.0	10.39	10.0	512
0.28	0.42	0.27	1.35	2.32	2.5	6.23	3.04	1.25	10.52	9.0	9.27	8.0	4.02	4.0	824
0.22	1.05	0.16	0.90	2.33	2.5	6.66	2.79	1.56	11.01	10.0	9.45	9.0	2.35	2.0	694
....	1.00	0.34	1.33	2.67	2.5	4.08	2.28	1.11	7.47	7.0	6.36	6.0	[1]9.29	10.0	695
....	0.90	0.45	1.33	2.68	2.5	4.89	2.80	1.28	8.97	7.0	7.69	6.0	[2]8.18	10.0	825
0.42	0.76	0.19	0.81	2.18	2.1	6.02	2.55	1.19	9.76	9.0	8.57	8.0	5.68	6.0	501
0.13	0.27	0.13	0.58	1.11	1.0	6.30	2.24	1.29	9.83	9.0	8.54	8.0	2.31	2.0	560
0.13	0.42	0.32	1.31	2.18	2.1	5.49	3.00	1.32	9.81	9.0	8.49	8.0	1.79	1.5	498
0.31	1.40	0.34	1.25	3.30	3.3	5.69	2.97	1.10	9.76	9.0	8.66	8.0	7.24	7.0	696
....	1.22	0.51	0.76	2.49	2.5	6.25	3.37	1.56	11.18	10.0	9.62	9.0	2.30	2.0	823
0.24	0.91	0.32	1.11	2.58	2.5	4.67	2.04	1.00	7.71	7.0	6.71	6.0	5.10	5.0	380
0.18	0.41	0.51	1.00	2.10	2.1	6.12	2.65	1.20	9.97	9.0	8.77	8.0	3.28	3.0	381
0.07	0.12	0.35	0.53	1.07	0.8	3.18	2.06	1.41	6.65	5.0	5.24	4.0	8.19	8.0	620
0.08	0.16	0.23	0.55	1.02	0.8	5.19	3.39	0.96	9.54	9.0	8.58	8.0	4.02	4.0	827
0.32	0.30	0.30	1.11	2.03	2.1	6.79	2.10	0.81	9.70	9.0	8.89	8.0	5.81	6.0	826
0.08	0.47	0.37	0.83	1.75	1.7	5.60	2.96	1.64	10.20	9.0	8.56	8.0	2.43	2.0	621
....	1.10	0.47	0.91	2.48	2.5	4.56	2.09	1.13	7.78	7.0	6.65	6.0	[3]10.24	10.0	655
0.13	0.72	0.35	0.95	2.15	2.1	6.24	2.37	0.87	9.48	9.0	8.61	8.0	3.13	3.0	622

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[1] 1.59% potash as muriate, 7.70% as sulphate. [2] 1.20% potash as muriate, 6.98% as sulphate.
[3] 1.10% potash as muriate, 9.14% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent: *Williams and Clark Branch:*				
513	Americus Ammoniated Bone Superphosphate	Waterbury, Wapping	....	$20.35	....
643	Americus Corn Phosphate	Milford, Wallingford, New Britain	$30.75	17.61	74.6
828	Americus H. G. Special Fertilizer	Wapping	38.50	26.34	46.2
428	Americus Potato Manure	Milford, Ellington, Wapping	32.00	18.74	70.8
623	Potato Phosphate	Waterbury, Ellington, New Britain	34.00	19.54	74.0
	The Armour Fertilizing Works, Baltimore, Md.				
368	All Soluble	New Haven, Bridgeport, Willimantic	33.25	21.38	55.5
514	Ammoniated Bone with Potash	Bridgeport, Willimantic	28.50	16.88	68.8
369*	Bidwell's Formula for all Crops	Windsor Locks	30.00	20.01	49.9
516	Bidwell's Formula for all Crops	Windsor Locks	30.00	20.94	43.3
723	Bone, Blood and Potash	Bridgeport	39.00	28.36	37.5
429†	Brewer's Special Fertilizer	East Hartford	36.00	25.92	38.9
722	Complete Potato	Groton, Danielson	29.50	17.26	70.9
515	Corn King	Groton, Silver Lane	31.50	19.88	58.5
724	Fish and Potash Mixture	Danielson, Meriden	25.00	14.62	71.0
725	Fruit and Root Crop Special	Danielson	28.00	17.98	55.7
367	H. G. Potato	New Haven, Bridgeport, Willimantic	33.75	....	....
726	Market Garden	New Haven	36.00	25.90	40.2
	Berkshire Fertilizer Co., Bridgeport, Conn.				
563	Ammoniated Bone Phosphate	Waterbury, Norwich Town, Stafford	28.25	15.00	88.3
284	Complete Fertilizer	Waterbury, Milldale, Hazardville	34.75	23.39	48.6
656	Grass Special	Norwich Town, Stafford, Windsor	36.25	25.81	40.4
517	Long Island Special	Milldale, Wethersfield	35.50	24.08	47.4
562	Potato and Vegetable Phosphate	Waterbury, Norwich Town, Stafford	32.00	18.77	70.5
727	Tobacco Special with Carbonate	Hazardville	38.00	30.17	26.0
	F. E. Boardman, Middletown, Conn.				
309†	Complete Fertilizer	Middletown	34.00	24.96	36.2

* See note, p. 49. † See note, p. 50.

ANALYSES AND VALUATIONS—*Continued.*

Nitrogen.						Phosphoric Acid.							Potash.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.47	0.63	0.33	1.21	2.64	2.5	6.25	3.49	1.24	10.98	10.0	9.74	9.0	2.29	2.0	513
0.29	0.25	0.29	1.31	2.14	2.1	5.43	3.44	1.56	10.43	9.0	8.87	8.0	1.74	1.5	643
....	1.90	0.37	1.18	3.45	3.3	5.34	3.84	1.18	10.36	9.0	9.18	8.0	6.86	7.0	828
0.15	0.55	0.45	1.01	2.16	2.1	6.04	2.59	1.02	9.65	9.0	8.63	8.0	3.47	3.0	428
0.23	1.12	0.22	0.95	2.52	2.5	4.24	2.55	1.28	8.07	7.0	6.79	6.0	5.01	5.0	623
1.36	0.25	0.51	0.88	3.00	2.9	5.65	2.36	0.92	8.93	8.5	8.01	8.0	4.04	4.0	368
0.76	0.20	0.27	1.29	2.52	2.5	4.14	2.35	0.67	7.16	6.5	6.49	6.0	2.24	2.0	514
....	0.07	0.66	1.32	2.05	2.5	5.95	2.34	0.93	9.22	8.5	8.29	8.0	[1]4.59	5.0	369
....	0.12	0.63	1.57	2.32	2.5	5.85	2.31	0.92	9.08	8.5	8.16	8.0	[2]4.61	5.0	516
2.44	0.20	0.39	1.37	4.40	4.1	4.01	3.58	1.13	8.72	8.5	7.59	8.0	7.11	7.0	723
1.09	0.06	0.20	3.10	4.45	4.5	2.50	1.78	0.17	4.45	4.5	4.28	4.0	[3]5.75	5.5	429
0.72	0.10	0.17	0.86	1.85	1.7	4.62	2.24	0.65	7.51	7.5	6.86	7.0	5.21	6.0	722
1.26	0.26	0.11	0.88	2.51	2.5	6.14	1.81	0.84	8.79	8.5	7.95	8.0	4.45	4.0	515
....	0.18	0.42	1.24	1.84	2.1	3.75	2.82	0.52	7.09	6.5	6.57	6.0	2.20	2.0	724
0.08	0.83	0.17	0.60	1.68	1.7	6.36	1.96	0.56	8.88	8.5	8.32	8.0	5.34	5.0	725
0.51	0.10	0.00	1.19	1.80	1.7	5.30	2.69	1.00	8.99	8.5	7.99	8.0	10.26	10.0	367
1.39	0.46	0.16	1.41	3.42	3.3	5.64	2.78	0.79	9.21	8.5	8.42	8.0	7.29	7.0	726
0.12	....	0.10	1.11	1.33	0.8	6.16	2.34	0.58	9.08	9.0	8.50	8.0	2.78	2.0	563
0.42	0.08	0.38	1.82	2.70	2.5	3.72	4.48	1.22	9.42	9.0	8.20	8.0	7.01	6.0	284
3.77	0.05	0.07	1.55	5.44	5.0	2.61	2.57	0.67	5.85	5.0	5.18	4.0	2.78	2.0	656
0.64	0.20	0.80	1.83	3.47	3.3	1.88	4.01	0.93	6.82	7.0	5.89	6.0	7.12	7.0	517
0.95	0.06	0.13	1.41	2.55	1.7	4.59	1.77	0.31	6.67	7.0	6.36	6.0	4.60	4.0	562
....	0.08	2.47	2.72	5.27	4.5	0.05	3.52	0.18	3.75	4.0	3.57	3.0	[4]6.13	5.5	727
1.28	0.05	0.37	1.51	3.21	3.0	1.66	4.96	0.84	7.46	....	6.62	7.0	8.98	9.0	309

[1] 0.81% potash as muriate, 3.78% as sulphate. [2] 0.73% potash as muriate, 3.88% as sulphate.
[3] 0.98% potash as muriate, 4.77% as sulphate.
[4] 1.00% potash as muriate, 3.28% as sulphate, 1.85% as carbonate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	Bowker Fertilizer Co., New York City.				
729	Complete Alkaline Tobacco Grower	East Windsor Hill	$38.00	$27.28	39.3
730*	Complete Alkaline Tobacco Grower with Carbonate	West Suffield	36.50	26.75	36.4
868	Complete Alkaline Tobacco Grower with Carbonate	West Suffield	36.50	29.04	25.7
518	Corn Phosphate	Willimantic, Norwich	29.75	15.92	86.8
547	Early Potato Manure	Yalesville, Silver Lane	37.00	25.01	47.9
728	Farm and Garden Phosphate	Hazardville, Jewett City	29.50	15.40	91.0
288	Fisherman's Brand Fish and Potash	Waterbury, Yalesville, Southington	29.75	16.93	75.7
582	Gloucester Fish and Potash	New Haven, Plainfield, Turnerville	25.00	13.33	87.5
382	Hill and Drill Phosphate	Waterbury, Hazardville, Norwich	34.75	20.20	72.0
731	Lawn and Garden Dressing	New Haven	....	21.81	....
548	Market Garden Fertilizer	East Hartford, Yalesville, Wethersfield	37.00	23.60	56.8
430	Potato and Vegetable Fertilizer	Hazardville, Rockville, E. Windsor Hill	33.75	20.30	66.3
431	Special Crop Grower	Westport	32.00	21.43	49.3
549	Sure Crop Phosphate	Yalesville, Willimantic	25.50	14.53	75.5
697	Tobacco Starter	Rockville, New Milford	34.00	20.92	62.5
657	Tobacco Ash Elements	West Suffield	32.50	20.91	55.4
287	Stockbridge Sp'l Complete Manure for Corn and all Grain Crops	Meriden, New Britain, Bristol	38.00	27.56	37.9
285*	Stockbridge Sp'l Complete Manure for Potatoes and Vegetables	New Haven, Waterbury, Meriden	35.50	25.67	38.3
432	Stockbridge Sp'l Complete Manure for Potatoes and Vegetables	Westport	35.50	25.57	38.8
550	Stockbridge Sp'l Complete Manure for Seeding Down, etc.	Yalesville, Yantic	38.50	23.71	62.4
742*	Stockbridge Sp'l Complete Manure for Tobacco	Glastonbury	48.00	29.55	62.4
896	Stockbridge Sp'l Complete Manure for Tobacco	Cromwell	48.00	33.45	43.5
286	Stockbridge Sp'l Complete Manure for Top Dressing and for Forcing	New Haven, Meriden, New Britain	39.00	26.53	47.0
	The Buffalo Fertilizer Co., Buffalo, N. Y.				
370†	Buffalo Tobacco Producer	Hazardville, Manchester Windsor Locks	40.25	27.53	46.2

* See note, p. 50. † See note, p. 51.

ANALYSES AND VALUATIONS—*Continued.*

NITROGEN.						PHOSPHORIC ACID.							POTASH.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.71	0.08	0.27	3.34	4.40	4.1	0.66	4.86	2.00	7.52	5.0	5.52	4.0	[1]5.56	5.0	729
0.74	0.08	0.21	3.15	4.18	4.1	0.61	5.48	2.42	8.51	5.0	6.09	4.0	[2]4.09	5.0	730
0.98	0.02	3.24		4.24	4.1	0.48	4.55	2.57	7.60	5.0	5.03	4.0	[3]6.22	5.0	868
0.22	0.72	0.28	0.50	1.72	1.7	6.22	2.34	1.15	9.71	9.0	8.56	8.0	2.26	2.0	518
0.89	1.11	0.22	1.13	3.35	3.3	4.71	2.68	1.36	8.75	8.0	7.39	7.0	7.48	7.0	547
0.21	0.68	0.27	0.50	1.66	1.7	6.11	2.43	0.93	9.47	9.0	8.54	8.0	2.03	2.0	728
....	0.93	0.52	1.02	2.47	2.5	2.02	2.42	1.96	6.40	5.0	4.44	4.0	4.08	4.0	288
0.10	0.33	0.15	0.57	1.15	0.8	5.45	2.51	1.02	8.98	9.0	7.96	8.0	2.17	1.0	582
0.64	0.96	0.19	0.96	2.75	2.5	6.77	2.36	1.41	10.54	10.0	9.13	9.0	2.37	2.0	382
0.89	1.38	0.06	1.09	3.42	3.3	2.48	2.16	4.26	8.90	8.0	4.64	4.0	5.05	5.0	731
0.99	0.50	0.18	0.95	2.62	2.5	3.54	3.05	1.19	7.78	7.0	6.59	6.0	9.74	10.0	548
0.60	1.01	0.11	0.85	2.57	2.5	5.79	2.43	1.27	9.49	9.0	8.22	8.0	4.33	4.0	430
0.12	1.00	0.18	0.58	1.88	1.6	6.12	1.77	0.43	8.32	9.0	7.89	8.0	9.11	10.0	431
0.15	0.35	0.20	0.45	1.15	0.8	6.90	1.90	1.27	10.07	10.0	8.80	9.0	2.54	2.0	549
0.71	0.89	0.30	0.70	2.60	2.5	5.00	3.40	2.10	10.50	9.0	8.40	8.0	[4]3.77	3.0	697
....	....	....	....	0.27	....	0.95	5.33	2.15	8.43	9.0	6.28	6.0	[5]13.48	15.0	657
0.56	2.09	0.00	0.78	3.43	3.3	9.48	1.35	0.38	11.21	11.0	10.83	10.0	7.17	7.0	287
0.67	1.36	0.02	1.18	3.23	3.3	4.65	2.39	0.99	8.03	7.0	7.04	6.0	9.30	10.0	285
0.97	0.94	0.20	1.14	3.25	3.3	4.26	2.44	1.05	7.75	7.0	6.70	6.0	9.39	10.0	432
1.03	0.43	0.20	1.00	2.66	2.5	3.39	3.32	1.30	8.01	9.0	6.71	6.0	9.53	10.0	550
0.24	1.25	0.27	1.70	3.46	5.8	0.96	3.86	1.00	5.82	5.0	4.82	4.0	[6]12.45	10.0	742
1.49	2.90	0.93		5.32	5.8	2.54	3.25	1.46	7.25	5.0	5.79	4.0	[7]9.83	10.0	896
1.35	1.05	0.16	2.06	4.62	4.9	1.89	3.31	1.18	6.38	6.0	5.20	4.0	6.28	6.0	286
....	2.14	0.23	2.17	4.54	4.5	4.08	1.68	0.41	6.17	6.0	5.76	5.0	[8]5.99	5.5	370

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[1] 0.80% potash as muriate, 4.76% as sulphate.

[2] 0.51% potash as muriate, 1.42% as sulphate, 2.16% as carbonate.

[3] 0.70% potash as muriate, 2.01% as sulphate, 3.51% as carbonate.

[4] 0.90% potash as muriate, 2.87% as sulphate.

[5] 1.30% potash as muriate, 12.18% as sulphate.

[6] 1.42% potash as muriate, 11.03% as sulphate.

[7] 1.79% potash as muriate, 8.04% as sulphate.

[8] 0.51% potash as muriate, 5.48% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent: **The Buffalo Fertilizer Co., Buffalo, N. Y.** *(Continued.)*				
290*	Celery and Potato Special	W. Cheshire, Hazardville, Manchester	$34.00	$21.70	56.7
467	Celery and Potato Special	Torrington	34.00	22.21	53.1
310	Farmers' Choice	Manchester, Ansonia, Branford	25.75	15.82	62.8
583	Fish Guano	Manchester, Plainfield, Moosup	26.25	15.08	74.1
743	High Grade Manure	Hazardville, Torrington	38.75	27.69	39.9
289	New England Special	W. Cheshire, Hazardville, Manchester	29.25	19.08	53.3
698*	Top Dresser	W. Cheshire, New Canaan	43.00	28.00	53.6
744	Vegetable and Potato	Norwich Town	33.00	21.75	51.7
	The E. D. Chittenden Co., Bridgeport, Conn.				
699	Complete Tobacco and Onion Grower	Rockville, Green's Farms	34.50	25.81	33.7
624†	Connecticut Tobacco Grower	Broad Brook (2), Windsorville	47.00	32.30	45.5
745	Fish and Potash	Windsorville, Rockville	29.00	25.90	11.9
748	Grain and Vegetable	Green's Farms	33.00	24.57	34.3
747	Grass and Grain	Rockville	37.00	24.94	48.4
749	Potato and Grain	Rockville, Broad Brook	36.00	25.25	42.6
746	Potato Manure	Windsorville, Warehouse Point	34.00	26.96	26.1
519	Tobacco Special	Broad Brook, Windsorville, Scitico	35.00	26.28	33.2
	The Everett B. Clark Seed Co., Milford, Conn.				
291	Special Mixture	Milford	32.00	26.48	20.8
292	Special 10%	Milford (2)	34.00	28.47	19.4
	The Coe-Mortimer Co., New York City.				
750	Celebrated Special Potato Fertilizer	Bristol, W. Hartford	31.50	18.29	72.2
471‡	Complete Manure 10% Potash	Suffield, Bristol, Torrington	36.50	24.88	46.7
383	Gold Brand Excelsior Guano	Suffield, Bristol, W. Hartford	35.50	21.95	61.8
384	H. G. Ammoniated Bone Superphosphate	Suffield, Bristol, W. Hartford	30.50	18.08	68.7
751	New Englander Corn and Potato Fertilizer	W. Hartford, Winsted	32.00	13.92	129.9
618‡	Peruvian Tobacco Fertilizer	Somersville, So. Manchester	49.00	32.42	51.1
752‡	Peruvian Vegetable Grower	West Cheshire, Bristol	42.00	27.38	53.4

* See note, p. 51. † See note, p. 52. ‡ See note, p. 53.

ANALYSES AND VALUATIONS—*Continued.*

Nitrogen.						Phosphoric Acid.							Potash.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.87	0.44	0.01	0.53	1.85	1.6	5.34	3.14	1.52	10.00	9.0	8.48	8.0	8.71	10.0	290
0.62	0.10	0.17	0.65	1.54	1.6	6.12	2.50	1.29	9.91	9.0	8.62	8.0	10.21	10.0	467
0.08	0.25	0.20	0.52	1.05	0.8	4.84	3.55	1.47	9.86	9.0	8.39	8.0	4.94	5.0	310
0.16	0.25	0.17	0.57	1.15	0.8	4.88	4.33	1.47	10.68	10.0	9.21	9.0	2.91	2.0	583
1.54	0.65	0.18	0.94	3.31	3.3	5.17	2.84	1.87	9.88	8.0	8.01	7.0	10.03	10.0	743
0.41	0.75	0.06	0.53	1.75	1.6	5.92	3.06	1.89	10.87	10.0	8.98	9.0	5.26	5.0	289
2.53	1.25	0.25	0.88	4.91	5.7	2.83	4.23	1.52	8.58	7.0	7.06	6.0	5.52	5.0	698
1.40	0.69	0.12	0.42	2.63	2.4	3.51	4.54	1.07	9.12	9.0	8.05	8.0	6.56	7.0	744
0.18	1.88	0.12	1.15	3.33	3.3	8.18	0.86	0.27	9.31	10.0	9.04	8.0	[1]5.84	5.0	699
0.27	2.02	0.05	2.46	4.80	5.0	3.61	0.83	0.17	4.61	6.0	4.44	4.0	[2]10.81	8.0	624
0.15	1.95	0.00	1.26	3.36	2.5	7.54	0.83	0.32	8.69	6.0	8.37	....	[3]6.37	4.0	745
0.21	1.57	0.05	1.38	3.21	2.5	7.74	0.87	0.13	8.74	10.0	8.61	8.0	[4]5.48	6.0	748
1.96	0.28	0.66	1.14	4.04	4.0	4.24	2.70	0.63	7.57	8.0	6.94	6.0	5.27	5.0	747
0.78	2.16	0.20	0.56	3.70	3.3	6.62	1.30	0.19	8.11	10.0	7.92	8.0	6.56	6.0	749
0.15	1.94	0.15	1.24	3.48	2.0	7.21	1.10	0.24	8.55	10.0	8.31	8.0	[5]7.04	6.0	746
0.18	1.95	0.60	1.83	4.56	4.3	2.86	0.74	0.15	3.75	5.0	3.60	3.0	[6]6.54	5.5	519
1.17	1.28	0.05	0.89	3.39	3.3	6.24	2.74	1.00	9.98	....	8.98	8.0	7.78	7.0	291
1.09	1.39	0.00	1.04	3.52	3.3	4.72	2.99	1.19	8.90	....	7.71	6.0	10.84	10.0	292
0.41	0.16	0.25	0.98	1.80	1.7	5.95	2.77	1.42	10.14	9.0	8.72	8.0	4.22	4.0	750
0.14	1.04	0.23	1.11	2.52	2.5	5.15	2.71	1.93	9.79	7.0	7.86	6.0	9.79	10.0	471
0.10	1.00	0.34	1.10	2.54	2.5	6.26	2.36	0.97	9.59	9.0	8.62	8.0	5.81	6.0	383
0.14	0.46	0.38	1.02	2.00	1.9	5.95	2.69	1.25	9.89	9.0	8.64	8.0	3.26	3.0	384
0.45	0.10	0.22	0.28	1.05	0.8	5.07	2.73	1.33	9.13	8.5	7.80	7.5	3.45	3.0	751
1.43	0.34	0.42	2.37	4.56	5.0	2.78	4.50	0.36	7.64	7.0	7.28	6.0	[7]9.62	10.0	618
1.20	0.50	0.48	1.02	3.20	3.3	5.88	2.69	0.81	9.38	9.0	8.57	8.0	[8]8.43	9.0	752

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[1] 0.51% potash as muriate, 5.33% as sulphate.

[2] 0.70% potash as muriate, 10.11% as sulphate.

[3] 0.40% potash as muriate, 5.97% as sulphate.

[4] 1.00% potash as muriate, 4.48% as sulphate.

[5] 0.40% potash as muriate, 6.64% as sulphate.

[6] 0.31% potash as muriate, 6.23% as sulphate.

[7] 1.79% potash as muriate, 7.83% as sulphate.

[8] 2.72% potash as muriate, 5.71% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent: **The Coe-Mortimer Co., New York City.** *(Continued.)*				
551	Red Brand Excelsior Guano........	West Cheshire, Bristol, Somersville.............	$37.75	$26.50	42.5
753	Tobacco and Onion Fertilizer......	Canton....................	32.00	26.96	18.7
	Conn. Valley Orchard Co., Berlin, Conn.				
293	H. G. Special Fertilizer............	Berlin.....................	27.00	21.88	23.4
	T. H. Eldredge, Norwich, Conn.				
371	Special Fish and Potash...........	Norwich..................	30.00	18.91	58.6
372	Special Superphosphate............	Norwich..................	28.00	15.93	75.8
	Essex Fertilizer Co., Boston, Mass.				
759	Complete Manure for Corn, Grain and Grass......................	East Hartford, Plainville...	41.50	25.94	60.0
434	Complete Manure for Potatoes, Roots and Vegetables............	Suffield, East Hartford, Plainville..............	39.25	25.91	51.5
450	Market Garden and Potato Manure.	East Hartford, Windsor Locks, Plainville........	36.00	20.41	76.4
760	Special Tobacco Manure...........	East Hartford, Hazardville.	44.50	32.46	37.2
433	Tobacco Starter and Grower.......	Suffield, East Hartford, Poquonock.............	39.00	26.35	48.0
435	XXX Fish and Potash.............	Suffield, East Hartford, Plainville..............	32.00	17.37	84.2
	Fertilizer Materials Supply Co., New York City.				
452*	No. 1 Potato and General Truck Fertilizer.........................	Westport.................	32.00	24.29	31.7
	The L. T. Frisbie Co., New Haven, Conn.				
312*	Connecticut Special Fertilizer......	Hartford, Wallingford, Rockville..............	36.50	22.99	58.8
468	Connecticut Special Fertilzer.......	Torrington...............	36.50	21.58	69.1
294*	Corn and Grain Fertilizer..........	Hartford, Wallingford, Bristol.................	30.00	18.19	65.0
451	Corn and Grain Fertilizer..........	New Haven...............	30.00	18.10	65.7
311	Potato Manure....................	New Haven, Hartford, Wallingford................	33.00	21.63	52.6
761	Top Dressing.....................	Rockville.................	39.00	26.06	49.7
472	Vegetable Grower.................	New Haven, Hartford, Winsted................	35.00	26.36	32.8

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* See note, p. 53.

ANALYSES AND VALUATIONS—*Continued.*

Nitrogen.						Phosphoric Acid.							Potash.		
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Total Nitrogen.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		So-called "Available."		Found.	Guaranteed.	Station No.
				Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
0.31	1.26	0.35	1.48	3.40	3.3	6.26	2.66	1.01	9.93	9.0	8.92	8.0	7.31	7.0	551
0.14	1.52	0.26	1.38	3.30	3.0	5.18	1.75	0.96	7.89	7.0	6.93	6.0	[1]8.54	8.0	753
0.08	0.78	0.34	1.42	2.62	2.5	7.13	2.67	1.07	10.87	10.0	9.80	9.0	3.97	4.0	293
....	0.21	0.65	1.58	2.44	2.1	2.14	3.54	2.15	7.83	6.0	5.68	5.0	4.86	4.0	371
0.08	0.06	0.28	0.91	1.33	1.0	4.07	4.69	2.96	11.72	10.0	8.76	8.0	2.78	2.0	372
1.01	0.05	0.77	1.33	3.16	3.3	4.69	1.94	0.55	7.18	7.0	6.63	6.0	9.96	10.0	759
1.07	0.10	0.87	1.10	3.14	3.3	4.56	1.89	0.47	6.92	7.0	6.45	6.0	10.30	10.0	434
0.44	0.06	0.98	0.61	2.09	2.0	6.85	1.98	1.52	10.35	9.0	8.83	8.0	5.13	5.0	450
1.47	0.10	0.91	1.45	3.93	4.1	3.51	4.84	1.10	9.45	7.0	8.35	6.0	[2]10.53	10.0	760
2.04	0.08	0.72	1.18	4.02	4.1	2.04	4.40	1.06	7.50	5.0	6.44	4.0	[3]6.22	6.0	433
0.70	0.06	0.50	0.76	2.02	2.0	6,18	2.05	0.47	8.70	9.0	8.23	8.0	3.15	3.0	435
0.45	1.97	0.00	0.79	3.21	3.3	6.98	1.50	0.88	9.36	....	8.48	8.0	6.44	7.0	452
0.36	0.07	0.88	1.23	2.54	2.5	3.89	2.11	0.27	6.27	7.0	6.00	6.0	9.71	10.0	312
0.35	0.05	0.74	1.20	2.34	2.5	3.86	2.02	0.27	6.15	7.0	5.88	6.0	9.03	10.0	468
0.10	0.55	0.54	0.69	1.88	1.5	4.41	5.11	2.39	11.91	9.0	9.52	8.0	2.76	3.0	294
0.12	0.50	0.55	0.83	2.00	1.6	5.78	3.14	1.20	10.12	9.0	8.92	8.0	3.08	3.0	451
....	0.79	0.73	0.96	2.48	2.5	4.97	3.02	0.75	8.74	8.0	7.99	7.0	6.37	6.0	311
0.47	0.04	1.44	2.17	4.12	4.1	4.43	3.72	0.83	8.98	8.0	8.15	7.0	3.95	4.0	761
0.10	1.60	0.77	1.00	3.47	3.3	4.30	3.26	1.14	8.70	8.0	7.56	6.0	8.33	8.0	472

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[1] 0.78% potash as muriate, 7.76% as sulphate. [2] 1.10% potash as muriate, 9.43% as sulphate.
[3] 0.90% potash as muriate, 5.32% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	Lister's Agricultural Chemical Works, Newark, N. J.				
762	Ammoniated Dissolved Bone Phosphate	No. Branford	$30.00	$18.30	63.9
700	Complete Tobacco Manure	Warehouse Pt., Glastonbury	37.00	23.85	55.1
454	Complete Tobacco Manure with Carbonate	Burnside, Glastonbury	39.00	27.85	40.0
701	Corn and Potato Fertilizer	Stafford, Danbury	30.50	18.08	68.7
453	Potato Manure	Warehouse Pt., Hamden, Burnside	36.75	25.60	43.6
552	Special Grass Mixture	Warehouse Pt., Glastonbury	36.00	24.99	44.1
771*	Special 10% Fertilizer	Manufacturer's sample	....	24.04	...
763	Standard Pure Bone Superphosphate of Lime	Burnside	32.00	20.05	59.6
644	Success Fertilizer	Warehouse Pt., Hamden, Moodus	29.25	15.81	85.0
764	3-6-10 for Potatoes	Glastonbury	36.00	24.58	46.5
	E. Manchester & Sons, Winsted, Conn.				
625*	Formula	So. Wethersfield, Winsted, Simsbury	31.25	26.06	19.9
805	Formula	Wethersfield	30.00	25.16	19.2
913	Formula	Winsted	32.00	25.78	24.1
702	Helper	Winsted, Wethersfield	27.00	21.37	26.3
765*	Special	So. Wethersfield, Winsted	35.00	28.68	22.0
	The Mapes Formula and Peruvian Guano Co., New York City.				
388	Average Soil Complete Manure	Windsor Locks, Southington, Hartford	37.75	26.95	40.1
766	Cereal Brand	Hartford, Hazardville	30.00	18.28	64.1
387	Complete Manure "A" Brand	Meriden, Southington, Hartford	36.00	22.15	62.5
313	Corn Manure	Windsor Locks, Meriden, Southington	36.25	22.58	60.5
580	Dissolved Bone	Hartford	33.00	22.98	43.6
767	Economical Potato Manure	Southington, Hartford	37.50	26.48	41.6
555	Fruit and Vine Manure	Southington, Hartford	41.50	25.62	61.9
314	Potato Manure	Windsor Locks, Suffield, Meriden	40.75	27.19	49.9

* See note, p. 54.

ANALYSES AND VALUATIONS—*Continued.*

NITROGEN.						PHOSPHORIC ACID.							POTASH.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.15	0.34	0.67	1.12	2.28	2.1	5.05	3.97	1.64	10.66	9.0	9.02	8.0	1.75	1.5	762
2.69	0.10	0.39	0.82	4.00	4.1	1.78	2.61	1.55	5.94	5.0	4.39	4.0	[1]5.62	5.0	700
2.62	0.00	0.37	1.20	4.19	4.1	0.32	3.43	3.40	7.15	5.0	3.75	4.0	[2]5.99	5.0	454
....	0.20	0.74	1.04	1.98	1.7	4.93	3.23	2.33	10.49	9.0	8.16	8.0	3.19	3.0	701
0.49	1.70	0.35	0.73	3.27	3.3	6.43	2.02	1.61	10.06	9.0	8.45	8.0	7.32	7.0	453
0.11	1.09	0.32	0.38	1.90	1.0	9.26	1.34	0.50	11.10	....	10.60	10.0	10.32	10.0	552
0.06	0.59	0.57	0.90	2.12	1.6	5.17	2.25	1.61	9.03	....	7.42	8.0	10.83	10.0	771
0.04	1.13	0.63	0.85	2.65	2.5	6.77	2.75	1.25	10.77	10.0	9.52	9.0	2.09	2.0	763
0.12	0.14	0.58	0.60	1.44	1.2	6.73	2.59	1.37	10.69	10.0	9.32	9.0	2.10	2.0	644
....	1.07	0.49	0.97	2.53	2.5	4.11	2.70	1.47	8.28	7.0	6.81	6.0	10.65	10.0	764
0.46	1.34	0.25	1.39	3.44	3.5	5.77	2.65	0.93	9.35	....	8.42	7.5	7.30	8.0	625
0.68	1.15	0.12	1.25	3.20	3.5	5.54	2.57	1.05	9.16	....	8.11	7.5	7.58	8.0	805
0.20	1.32	1.66		3.18	3.5	5.94	2.18	1.15	9.27	....	8.12	7.5	8.13	8.0	913
0.30	0.14	0.37	0.93	1.74	1.6	6.36	2.11	1.32	9.79	....	8.47	8.0	8.28	8.0	702
0.03	4.11	0.00	0.50	4.64	5.0	6.59	1.31	0.47	8.37	....	7.90	7.5	[3]5.78	7.5	765
3.20	0.18	0.34	0.70	4.42	4.1	1.57	6.32	0.63	8.52	8.0	7.89	7.0	[4]5.04	5.0	388
1.00	0.34	0.12	0.78	2.24	1.7	0.64	6.93	1.32	8.89	8.0	7.57	6.0	4.46	3.0	766
2.05	0.33	0.14	0.47	2.99	2.5	0.97	9.44	2.33	12.74	12.0	10.41	10.0	3.08	2.5	387
1.54	0.19	0.15	0.82	2.70	2.5	0.85	7.86	1.47	10.18	10.0	8.71	8.0	6.50	6.0	313
....	0.20	0.75	1.47	2.42	2.1	3.67	12.72	1.01	17.40	....	16.39	12.0	....	....	580
2.29	0.42	0.07	0.83	3.61	3.3	0.55	5.63	0.70	6.88	6.0	6.18	4.0	[5]8.60	8.0	767
1.23	0.12	0.07	0.86	2.28	1.7	0.40	5.84	1.18	7.42	7.0	6.24	5.0	[6]11.82	10.0	555
3.13	0.10	0.00	0.44	3.67	3.7	1.27	7.36	0.79	9.42	8.0	8.63	8.0	[7]7.32	6.0	314

[1] 0.90% potash as muriate, 4.72% as sulphate.

[2] 0.60% potash as muriate, 0.54% as sulphate, 4.85% as carbonate.

[3] 0.60% potash as muriate, 5.18% as sulphate.

[4] 0.80% potash as muriate, 4.24% as sulphate.

[5] 1.00% potash as muriate, 7.60% as sulphate.

[6] 1.40% potash as muriate, 10.42% as sulphate.

[7] 0.85% potash as muriate, 6.47% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 5.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	The Mapes Formula and Peruvian Guano Co., New York City. *(Continued.)*				
770	Seeding Down Manure	Hartford	$42.00	$33.12	26.8
554	Tobacco Ash Constituents	Hartford, Windsor Locks, Suffield	34.75	28.00	24.1
553*	Tobacco Manure, Wrapper Brand	Hartford, Broad Brook, Windsor Locks	49.25	41.81	17.8
386	Tobacco Starter, Improved	Windsor Locks, Suffield, Hartford	37.75	26.40	43.0
769	Top Dresser, Imp'd, Full Strength	Hartford, Forestville	53.00	44.59	18.9
385	Top Dresser, Imp'd, Half Strength	Windsor Locks, Middletown, Hartford	34.75	21.78	59.6
768	Vegetable Manure for Light Soils	Meriden, Hartford	43.00	31.36	37.1
	The National Fertilizer Co., New York City.				
473	Ammoniated Bone Phosphate	Willimantic, Silver Lane, Winsted	28.25	16.67	69.5
556	Complete Grass Fertilizer	So. Manchester, Greenwich	38.00	23.66	60.6
772	Complete Grass Fertilizer	Chester	38.00	24.58	54.6
557	Complete Root and Grain Fertilizer	So. Manchester, Silver Lane	38.50	24.45	57.5
658	Complete Tobacco Fertilizer	East Windsor Hill, New Milford	36.75	24.49	50.1
585*	Eureka Potato Fertilizer	So. Manchester, Willimantic, Guilford	35.75	22.96	55.7
793	Eureka Potato Fertilizer	Chester	35.75	23.70	50.9
455	Fish and Potash	West Cheshire, So. Manchester, Silver Lane	30.25	20.05	50.9
774	Formula "A"	Willimantic	35.00	22.28	57.1
773	Market Garden Fertilizer	Greenwich, Chester	36.00	22.29	61.5
456	Potato Phosphate	So. Manchester, Willimantic, Silver Lane	32.00	20.76	54.1
659	Tobacco Special	So. Manchester, Warehouse Pt., New Milford	37.25	27.15	37.2
775	Tobacco Special with Carbonate	So. Manchester, Warehouse Pt.	40.00	27.66	44.6
584	XXX Fish and Potash	So. Manchester, No. Branford, Guilford	28.75	17.21	67.1

* See note, p. 54.

ANALYSES AND VALUATIONS—*Continued.*

Nitrogen.						Phosphoric Acid.							Potash.		
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Total Nitrogen.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		So-called "Available."		Found.	Guaranteed.	Station No.
				Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.			
2.86	0.02	0.12	0.38	3.38	2.5	0.08	12.97	4.95	18.00	18.0	13.05	....	10.92	10.0	770
0.31	0.07	0.74		1.12	0.5	0.17	1.90	3.98	6.05	5.7	2.07	....	[1]15.17	15.0	554
4.06	0.07	0.44	2.33	6.90	6.2	0.12	4.26	1.20	5.58	4.5	4.38	....	[2]10.13	10.5	553
2.94	0.21	0.29	1.42	4.86	4.1	0.27	7.13	4.38	11.78	8.0	7.40	6.0	[3]1.97	1.0	386
5.94	3.38	0.55	0.27	10.14	9.9	0.38	6.45	0.63	7.46	8.0	6.83	5.0	[4]4.90	4.0	769
3.34	1.40	0.07	0.16	4.97	4.9	0.33	2.66	0.99	3.98	4.0	2.99	2.5	[5]2.41	2.0	385
4.12	0.10	0.13	0.79	5.14	4.9	0.89	7.15	0.56	8.60	8.0	8.04	6.0	[6]7.05	6.0	768
0.22	0.45	0.27	0.80	1.74	1.7	6.41	2.23	1.71	10.35	9.0	8.64	8.0	2.53	2.0	473
0.98	0.60	0.24	1.80	3.62	4.1	5.87	1.32	0.32	7.51	7.0	7.19	6.0	4.98	5.0	556
0.84	0.67	0.33	1.96	3.80	4.1	5.05	1.74	0.55	7.34	7.0	6.79	6.0	5.58	5.0	772
0.36	1.00	0.18	1.66	3.20	3.3	6.25	2.13	0.69	9.07	9.0	8.38	8.0	6.30	6.0	557
....	1.45	0.31	1.39	3.15	3.3	6.70	2.18	0.87	9.75	9.0	8.88	8.0	[7]5.17	5.0	658
0.56	0.70	0.20	1.15	2.61	2.5	3.89	2.62	0.87	7.38	7.0	6.51	6.0	9.08	10.0	585
0.55	0.38	0.29	1.60	2.82	2.5	4.06	3.09	1.01	8.16	7.0	7.15	6.0	8.15	10.0	793
0.14	0.85	0.19	1.55	2.73	2.9	5.11	1.48	1.20	7.79	7.0	6.59	6.0	4.60	4.0	455
0.48	1.24	0.59	1.12	3.43	3.3	4.07	1.61	0.49	6.17	7.0	5.68	6.0	5.83	6.0	774
0.35	0.65	0.16	1.37	2.53	2.5	6.65	1.91	0.83	9.39	9.0	8.56	8.0	6.26	6.0	773
0.50	0.50	0.19	0.91	2.10	2.1	6.31	2.39	1.00	9.70	9.0	8.70	8.0	6.22	6.0	456
0.30	0.16	0.34	3.80	4.60	4.6	1.41	2.88	1.04	5.33	4.0	4.29	3.0	[8]5.74	5.5	659
....	0.05	3.39	1.10	4.54	4.6	0.41	3.04	2.23	5.68	4.0	3.45	3.0	[9]5.08	5.5	775
0.59	0.65	0.18	1.03	2.45	2.5	3.88	1.84	0.92	6.64	6.0	5.72	5.0	3.74	3.0	584

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[1] 2.70% potash as muriate, 2.86% as sulphate, 9.61% as carbonate.

[2] 1.79% potash as muriate, 2.20% as sulphate, 6.14% as carbonate.

[3] 1.25% potash as muriate, 0.72% as sulphate.

[4] 0.90% potash as muriate, 4.00% as sulphate.

[5] 0.45% potash as muriate, 1.96% as sulphate.

[6] 1.10% potash as muriate, 5.95% as sulphate.

[7] 1.50% potash as muriate, 3.67% as sulphate.

[8] 0.60% potash as muriate, 5.14% as sulphate.

[9] 0.51% potash as muriate, 1.82% as sulphate, 2.75% as carbonate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	New England Fertilizer Co., Boston, Mass.				
564	Corn and Grain Fertilizer	Plantsville, Rockville	$29.00	$13.90	108.6
777	Corn Phosphate	Jewett City	31.00	16.77	84.8
778	H. G. Potato Fertilizer	Plantsville	35.00	20.90	67.5
776	Perfect Tobacco Grower	Warehouse Pt., Glastonbury	36.75	26.27	39.8
565	Potato Fertilizer	Plantsville, Rockville	31.00	17.01	82.2
779	Potato Grower	Rockville	38.00	22.72	67.3
566	Superphosphate	Plantsville, Wallingford, Middlefield	32.25	20.20	59.7
	The Niantic Menhaden Oil and Guano Co., South Lyme, Conn.				
457	Bone, Fish and Potash	Windsor Locks, Norwich, Suffield	30.25	23.51	28.7
781	Corn and Grain Fertilizer	Norwich, East Haddam	32.50	20.39	59.4
703	H. G. Tobacco Fertilizer	East Haddam, Silver Lane.	34.50	27.48	25.9
780	Market Garden Manure	Norwich, Moodus	36.00	27.58	30.5
586	Potato and Vegetable Manure	Norwich, Suffield	32.50	23.19	40.1
	Olds & Whipple, Hartford, Conn.				
335	Complete Corn and Potato Fertilizer	Hartford	34.00	25.33	34.2
336	Complete Grass Fertilizer	Hartford	34.00	25.09	35.5
337	Complete Tobacco Fertilizer	Hartford	37.00	31.59	17.1
338	Fish and Potash	Hartford	30.00	19.60	53.1
339	H. G. Potato Fertilizer	Hartford	37.00	28.68	29.0
375	Special Phosphate	Hartford	35.00	25.69	36.2
277*	Vegetable Ash and Bone	Hartford	44.00	34.31	28.2
	Parmenter & Polsey Fertilizer Co., Boston, Mass.				
794	Grain Grower	Plantsville	32.00	12.68	152.4
782	Plymouth Rock Brand	Plantsville, Plainville, E. Hampton	34.25	19.21	78.3
795	Potato Fertilizer	Plantsville	34.00	16.61	104.7
796	Potato Grower	East Hampton	38.00	23.02	65.1
567	Special Tobacco Grower	Warehouse Pt., Wallingford	38.00	27.50	38.2
	The Frank S. Platt Co., New Haven, Conn.				
376	Platco Market Garden Phosphate	New Haven	35.00	21.46	63.1

* See note, p. 55.

ANALYSES AND VALUATIONS—*Continued.*

NITROGEN.						PHOSPHORIC ACID.							POTASH.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
....	0.04	0.94	0.46	1.44	1.2	4.85	2.56	0.61	8.02	8.0	7.41	7.0	2.11	2.0	564
0.16	0.05	0.72	0.85	1.78	1.6	5.94	2.12	0.72	8.78	9.0	8.06	8.0	3.25	3.0	777
1.16	0.08	0.31	0.87	2.42	2.5	6.71	1.85	0.42	8.98	9.0	8.56	8.0	5.46	6.0	778
2.15	0.03	0.65	1.05	3.88	4.1	2.01	4.46	1.18	7.65	5.0	6.47	4.0	[1]6.63	6.0	776
0.10	0.36	0.57	0.71	1.74	1.6	4.72	3.07	0.72	8.51	8.0	7.79	7.0	4.27	4.0	565
0.86	0.28	0.43	0.88	2.45	2.5	4.68	1.53	0.38	6.59	7.0	6.21	6.0	9.88	10.0	779
1.02	0.06	0.77	0.69	2.54	2.5	6.34	1.89	0.81	9.04	9.0	8.23	8.0	4.17	4.0	566
0.50	0.40	0.53	1.70	3.13	2.5	2.91	3.46	1.28	7.65	6.0	6.37	5.0	[2]6.03	3.0	457
0.47	0.23	0.47	1.27	2.44	2.1	4.68	3.03	0.70	8.41	8.0	7.71	7.0	[3]4.39	3.5	781
1.16	0.22	0.36	1.94	3.68	3.3	5.58	2.57	0.88	9.03	8.0	8.15	7.0	[4]6.53	6.0	703
1.24	0.22	0.34	2.02	3.82	4.1	5.77	2.36	0.65	8.78	8.0	8.13	7.0	[5]6.23	6.0	780
0.78	0.25	0.51	1.46	3.00	2.5	4.94	3.82	0.72	9.48	8.0	8.76	7.0	[6]4.36	4.0	586
....	0.79	0.49	2.26	3.54	3.3	0.20	6.68	1.56	8.44	7.0	6.88	6.0	[7]6.24	6.0	335
0.53	0.20	0.51	2.36	3.60	3.3	0.52	5.80	1.13	7.45	7.0	6.32	6.0	[8]5.96	6.0	336
0.58	0.10	1.69	2.33	4.70	4.5	0.11	4.46	0.61	5.18	3.5	4.57	3.0	[9]6.81	5.5	337
....	0.26	0.75	1.81	2.82	2.5	2.73	3.40	0.42	6.55	6.0	6.13	5.0	4.31	3.0	338
....	1.23	0.50	1.95	3.68	3.3	0.66	6.13	0.99	7.78	7.0	6.79	6.0	[10]10.24	10.0	339
....	1.50	0.77	2.34	4.61	4.1	3.03	2.67	0.61	6.31	....	5.70	4.0	[11]3.76	3.0	375
....	....	....	....	....	....	0.20	11.22	0.17	11.59	....	11.42	12.0	[12]16.76	15.0	277
....	0.06	0.67	0.48	1.21	1.2	4.72	2.64	0.65	8.01	8.0	7.36	7.0	1.75	2.0	794
0.81	0.18	0.75	0.68	2.42	2.5	6.30	1.70	0.64	8.64	9.0	8.00	8.0	3.80	4.0	782
....	0.04	0.74	0.68	1.46	1.6	3.75	3.09	0.43	7.27	7.0	6.84	6.0	5.95	6.0	795
0.99	0.18	0.41	0.90	2.48	2.5	4.81	1.53	0.36	6.70	7.0	6.34	6.0	9.99	10.0	796
2.33	0.05	0.55	1.17	4.10	4.1	1.69	4.18	1.05	6.92	5.0	5.87	4.0	[13]7.65	8.0	567
0.42	1.07	0.27	1.04	2.80	2.5	6.52	2.08	1.23	9.83	9.0	8.60	8.0	4.17	4.0	376

[1] 1.00% potash as muriate, 5.63% as sulphate.

[2] 0.80% potash as muriate, 5.23% as sulphate.

[3] 0.28% potash as muriate, 4.11% as sulphate.

[4] 0.51% potash as muriate, 6.02% as sulphate.

[5] 0.45% potash as muriate, 5.78% as sulphate.

[6] 0.40% potash as muriate, 3.96% as sulphate.

[7] 2.13% potash as muriate, 4.11% as sulphate.

[8] 0.25% potash as muriate, 5.71% as sulphate.

[9] 0.40% potash as muriate, 0.79% as sulphate, 5.62% as carbonate.

[10] 6.68% potash as muriate, 3.56% as sulphate.

[11] 0.70% potash as muriate, 3.06% as sulphate.

[12] 1.05% potash as muriate, 1.73% as sulphate, 13.98% as carbonate.

[13] 1.09% potash as muriate, 6.56% as sulphate.

Nitrogenous Superphosphates.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	The Rogers & Hubbard Co., Middletown, Conn.				
590	"Bone Base" Complete Phosphate.	Wallingford, Bristol, Somersville	$28.25	$18.35	53.9
316	"Bone Base" Fruit, or Grass and Grain Fertilizer	Middletown	44.00	31.98	37.6
587	"Bone Base" New Market Garden Phosphate	New Britain, Granby	36.00	23.69	51.9
315	"Bone Base" Oats and Top Dressing	Middletown	55.00	43.27	27.1
458	"Bone Base" Potato Phosphate	New Britain, Granby, Glastonbury	34.00	21.67	56.9
589	"Bone Base" Soluble Corn and General Crops Manure	New Canaan, East Hampton, Somersville	36.75	23.75	54.7
591	"Bone Base' Soluble Potato Manure	East Hampton, Glastonbury, Suffield	44.00	31.30	40.6
588*	"Bone Base" Soluble Tobacco Manure	Wallingford, Granby, Glastonbury	48.50	36.48	32.9
	The Rogers Mfg. Co., Rockfall, Conn.				
798	All Round Fertilizer	Brooklyn, Rockfall	30.00	18.14	65.4
735†	Carbonate Formula for Tobacco	Suffield	33.50	28.78	16.4
803	Complete Potato and Vegetable Fertilizer	Wapping	32.50	21.98	47.9
799	Fish and Potash	Wapping, Warehouse Pt.	28.50	21.53	32.4
800	H. G. Complete Corn and Onion Manure	Suffield, Somersville	37.25	26.28	41.7
664	H. G. Grass and Grain	Rockfall, So. Manchester	42.25	35.38	19.4
804	H. G. Oats and Top Dressing	Suffield	45.00	36.21	24.3
801	H. G. Soluble Tobacco Manure.	Glastonbury, Thompsonville	43.50	35.75	21.7
802	H. G. Tobacco and Potato Manure.	Suffield, Somersville	40.25	30.69	31.2
704	H. G. Tobacco Grower	Burnside, Glastonbury	39.00	29.31	33.0
797	Tobacco Grower, Vegetable and Carbonate Formula	Suffield, Glastonbury	39.75	30.11	32.0
	F. S. Royster Guano Co., Baltimore, Md.				
521	Ammoniated Potato Manure	No. Granby, Torrington	33.25	19.68	68.9
663	Champion Crop Compound	Pomfret Center	30.00	17.33	73.1
627	Fish and Potash	Torrington, Pomfret Center, No. Haven	28.00	16.28	72.0
661	Garden and Truck Guano	Torrington, Marbledale	32.00	21.16	51.4
662	General Crop Fertilizer	Killingly, Marbledale	24.75	15.49	59.8

* See note, p. 55. † See note, p. 56.

ANALYSES AND VALUATIONS—*Continued.*

NITROGEN.						PHOSPHORIC ACID.							POTASH.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.36	0.07	0.25	1.04	1.72	1.5	4.98	3.04	0.87	8.89	8.0	8.02	7.0	5.61	5.0	590
0.36	0.15	0.44	1.84	2.79	2.2	0.13	10.24	6.81	17.18	16.0	10.37	6.5	12.47	12.0	316
0.90	0.10	0.16	1.10	2.26	2.0	3.95	3.13	0.95	8.03	7.0	7.08	6.0	10.78	10.0	587
8.13	0.03	0.03	0.61	8.80	8.5	0.02	7.24	2.05	9.31	8.0	7.26	4.5	8.56	8.0	315
0.85	0.10	0.18	1.04	2.17	2.0	6.82	3.02	1.06	10.90	10.0	9.84	9.0	5.79	5.0	458
1.15	0.06	0.39	1.00	2.60	2.5	2.29	5.07	1.33	8.69	8.0	7.36	6.0	9.20	8.0	589
2.41	0.14	0.40	2.08	5.03	5.0	1.61	6.84	2.03	10.48	10.0	8.45	7.0	[1] 5.78	5.0	591
2.34	0.14	0.43	2.27	5.18	5.0	1.22	7.45	2.33	11.00	10.0	8.67	7.0	[2] 9.84	10.0	588
0.64	0.08	0.73	0.41	1.86	1.6	6.42	3.73	0.72	10.87	10.0	10.15	8.0	2.81	2.0	798
...	....	....	....	1.44	....	0.10	3.57	4.81	8.48	7.5	3.67	....	[3] 13.50	14.0	735
1.05	0.08	0.36	1.25	2.74	2.3	2.62	5.75	1.65	10.02	10.0	8.37	8.0	5.30	5.0	803
1.24	0.10	0.47	1.85	3.66	3.3	1.96	2.68	0.92	5.56	6.0	4.64	4.0	4.73	3.8	799
0.91	0.09	0.61	2.01	3.62	3.6	3.20	3.73	0.92	7.85	8.0	6.93	6.0	7.99	7.0	800
0.16	0.02	0.22	2.58	2.98	3.0	0.06	11.73	6.56	18.35	16.0	11.79	....	14.22	12.5	664
3.73	0.22	0.88	1.49	6.32	6.3	0.45	7.73	1.27	9.45	9.0	8.18	7.0	8.30	7.5	804
1.61	0.29	1.00	2.09	4.99	5.0	0.45	6.47	0.72	7.64	8.0	6.92	6.0	[4] 11.52	11.0	801
0.95	0.26	1.00	1.49	3.70	3.5	0.56	7.86	1.47	9.89	9.0	8.42	7.0	[5] 9.60	8.8	802
1.00	0.42	1.17	2.48	5.07	5.0	0.09	4.14	0.73	4.96	4.0	4.23	3.0	[6] 6.87	5.5	704
1.09	0.18	0.74	3.41	5.42	5.0	0.14	4.04	0.27	4.45	4.0	4.18	3.0	[7] 5.77	5.5	797
....	0.95	0.51	1.21	2.67	2.5	2.69	3.55	1.04	7.28	6.5	6.24	6.0	5.08	5.0	521
....	0.60	0.50	0.66	1.76	1.7	2.37	5.92	1.09	9.38	8.5	8.29	8.0	4.27	4.0	663
....	0.86	0.34	1.00	2.20	2.1	2.00	4.44	1.16	7.60	6.5	6.44	6.0	2.99	3.0	627
....	1.30	0.36	1.14	2.80	2.5	2.93	4.87	2.00	9.80	8.0	7.80	8.0	4.50	4.0	661
....	0.52	0.04	0.52	1.08	0.8	2.10	6.29	1.22	9.61	8.5	8.39	8.0	4.98	5.0	662

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[1] 1.66% potash as muriate, 4.12% as sulphate.

[2] 1.40% potash as muriate, 8.44% as sulphate.

[3] 1.99% potash as muriate, 3.03% as sulphate, 8.48% as carbonate.

[4] 1.17% potash as muriate, 10.35% as sulphate.

[5] 1.14% potash as muriate, 8.46% as sulphate.

[6] 0.74% potash as muriate, 6.13% as sulphate.

[7] 0.90% potash as muriate, 3.41% as sulphate, 1.46% as carbonate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	F. S. Royster Guano Co., Baltimore, Md. *(Continued.)*				
628*	High Grade Tobacco Manure	Glastonbury, So. Windsor, Broad Brook	$45.50	$30.88	47.3
520	Ideal Tobacco Guano	No. Granby, So. Windsor, Suffield	35.25	27.50	28.2
660*	Tobacco Ash Components	Suffield, South Windsor	33.50	20.32	64.9
626	Universal Truck Fertilizer	Milford, Killingly, No. Haven, Rockville	34.50	25.00	38.0
	Sanderson Fertilizer and Chemical Co., New Haven, Conn.				
459	Atlantic Coast Bone, Fish and Potash	East Hartford, Guilford, Plainville	26.00	18.41	41.2
592	Complete Tobacco Grower	Warehouse Pt., So. Windsor	34.00	26.97	26.1
502	Corn Superphosphate	Shelton, Torrington, East Hampton	28.75	17.66	62.8
340	Formula A	East Hartford, Shelton, Derby	35.00	25.01	39.9
499	Formula B	East Hartford, Warehouse Pt. (2)	34.00	25.59	32.9
665	Kelsey's Bone, Fish and Potash	Branford	27.50	24.26	13.4
500	Potato Manure	Shelton, Derby, Plainville	30.25	18.96	59.5
806	Special with 10% Potash	New Haven	37.00	24.08	53.7
503	Top Dressing for Grass and Grain	New Haven, Warehouse Pt., East Hampton	38.00	29.62	28.3
	The C. M. Shay Fertilizer Co., Groton, Conn.				
568	Corn Fertilizer	Guilford, Turnerville, Putnam	29.75	20.98	41.8
569*	Potato Manure	Guilford, Middlefield, Putnam	33.75	26.57	27.0
645*	Grass Fertilizer	Groton, Turnerville, Killingworth	36.25	27.00	34.3
	M. L. Shoemaker & Co., Philadelphia, Pa.				
341	"Swift-Sure" Superphosphate for General Use	Hartford, Windsor Locks, Guilford	35.25	27.06	30.3
808†	"Swift-Sure" Superphosphate for Potatoes	Guilford	35.00	25.90	35.1
807	"Swift-Sure" Superphosphate for Truck, Corn and Onions	Guilford	29.00	22.20	30.6

* See note, p. 56. † See note, p. 57.

ANALYSES AND VALUATIONS—*Continued.*

NITROGEN.						PHOSPHORIC ACID.							POTASH.		
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Total Nitrogen.		Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.		So-called "Available."				Station No.
				Found.	Guaranteed.				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	
....	2.15	0.38	1.81	4.34	4.9	4.71	2.94	0.32	7.97	5.5	7.65	5.0	[1]8.70	10.0	628
0.12	1.68	0.50	1.90	4.20	4.1	2.86	3.13	0.99	6.98	4.5	5.99	4.0	[2]6.83	6.0	520
....	....	....	....	0.44	....	1.34	5.59	0.55	7.48	6.5	6.93	6.0	[3]14.86	15.0	660
....	1.69	0.41	1.12	3.22	3.3	3.48	4.74	1.30	9.52	8.5	8.22	8.0	7.26	7.0	626
0.17	0.42	0.34	1.48	2.41	1.7	1.40	4.16	1.98	7.54	6.0	5.56	4.0	4.42	4.0	459
0.37	0.10	0.28	3.80	4.55	4.5	1.13	3.68	0.27	5.08	4.0	4.81	3.0	[4]5.75	5.5	592
0.38	0.16	0.27	1.05	1.86	1.7	4.55	3.97	2.53	11.05	9.0	8.52	7.0	3.02	2.0	502
1.18	0.62	0.30	1.25	3.35	3.3	4.38	3.59	1.84	9.81	9.0	7.97	6.0	6.62	6.0	340
0.21	1.41	0.14	1.65	3.41	3.3	3.63	3.69	2.21	9.53	10.0	7.32	6.0	[5]6.21	6.0	499
....	0.70	0.82	1.78	3.30	2.5	1.89	4.72	1.07	7.68	5.0	6.61	4.0	[6]6.13	4.0	665
0.19	0.45	0.28	1.13	2.05	1.7	2.60	3.55	2.06	8.21	8.0	6.15	5.0	6.45	6.0	500
0.75	1.05	0.34	0.50	2.64	2.5	4.55	1.68	0.45	6.68	8.0	6.23	5.0	10.97	10.0	806
2.06	0.53	0.50	1.31	4.40	4.0	4.31	4.26	1.69	10.26	....	8.57	7.0	7.32	7.0	503
....	0.07	0.86	1.95	2.88	2.5	4.64	3.02	0.59	8.25	....	7.66	7.0	3.80	3.0	568
0.93	0.12	0.97	1.96	3.98	3.5	3.53	4.39	0.96	8.88	....	7.92	7.5	5.77	6.0	569
0.73	0.10	1.21	2.08	4.12	4.0	2.93	4.21	1.05	8.19	....	7.14	7.5	6.27	6.0	645
1.17	0.02	0.70	1.19	3.08	2.9	8.60	2.81	0.91	12.32	....	11.41	9.0	[7]5.41	4.5	341
1.10	0.02	0.68	0.87	2.67	2.9	7.00	4.06	1.87	12.93	....	11.06	8.0	7.07	7.0	808
0.84	0.00	0.45	0.95	2.24	1.7	6.73	3.50	1.78	12.01	....	10.23	8.0	5.34	5.0	807

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[1] 1.99% potash as muriate, 6.71% as sulphate.

[2] 1.00% potash as muriate, 5.83% as sulphate.

[3] 14.26% potash as muriate, 0.60% as sulphate.

[4] 0.94% potash as muriate, 4.81% as sulphate.

[5] 0.90% potash as muriate, 5.31% as sulphate.

[6] 1.40% potash as muriate, 4.73% as sulphate.

[7] 0.40% potash as muriate, 5.01% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 3.	Percentage difference between cost and valuation.
	Sampled by Station Agent: **Swift's Lowell Fertilizer Co., Boston, Mass.**				
345	Animal Brand	Windsor Locks, Suffield, Wallingford, Southington	$32.75	$19.73	66.0
343	Bone Fertilizer	Windsor Locks, Rockville, Guilford	30.00	17.48	71.6
504	Corn and Vegetable Manure	Wallingford, New Canaan, Torrington,	38.00	25.32	50.1
647	Empress Brand	Southington, New Britain, Moosup	27.75	12.95	114.3
505	Perfect Tobacco Grower	Rockville, Ellington, Warehouse Pt.	38.25	25.77	48.4
810*	Market Garden Manure	Rocky Hill, So. Manchester	39.00	26.48	47.3
342*	Potato Grower	Southport, Wallingford, Guilford	35.00	26.05	34.4
344	Potato Manure	Windsor Locks, Southington, Rockville	31.75	16.35	94.1
389*	Potato Phosphate	New Britain, Suffield, Southport	34.00	21.16	60.7
506*	Special Grass Mixture	New Britain, Rockville, Ellington	39.00	27.16	43.6
648*	Special Potato Fertilizer	New Britain, Torrington, Saybrook	36.75	23.29	57.8
646*	Superior Fertilizer	Wallingford, Rockville, Wethersfield	37.75	27.85	35.6
809	Tobacco Manure	New Hartford	43.00	32.10	34.0
	Tanner & Wilcox, Winsted, Conn.				
469	Grass and Corn Phosphate	Winsted	37.00	31.32	18.1
470*	Reliable Potato and Garden Phosphate	Winsted	34.00	29.00	17.2
	The Wilcox Fertilizer Co., Mystic, Conn.				
812	Complete Bone Superphosphate	Wallingford	29.00	19.62	47.7
818	Corn Special	Ellington, Westchester	32.50	22.72	43.0
507	Fish and Potash	Norwich, Wallingford, East Hampton	27.00	20.05	34.7
813	4-8-10 Fertilizer	Mystic	40.50	29.38	37.8
814	Grass Fertilizer	Mystic	37.50	25.85	45.1
816	H. G. Fish and Potash	Ellington	31.00	24.44	26.8
815	H. G. Tobacco Special	Ellington	38.00	27.29	39.3
649	Potato Fertilizer	Norwich, East Hampton, Thompsonville	32.25	20.13	60.2

* See note, p. 57.

ANALYSES AND VALUATIONS—*Continued.*

NITROGEN.						PHOSPHORIC ACID.							POTASH.		
				Total. Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Station No.
0.41	0.42	0.78	0.80	2.41	2.5	5.99	2.26	0.67	8.92	9.0	8.25	8.0	4.14	4.0	345
0.26	0.26	0.72	0.55	1.79	1.6	6.20	2.81	1.10	10.11	9.0	9.01	8.0	3.13	3.0	343
1.50	0.05	0.75	0.98	3.28	3.3	6.37	1.82	0.50	8.69	9.0	8.19	8.0	7.34	7.0	504
0.15	0.03	0.62	0.54	1.34	1.3	4.44	2.53	0.51	7.48	8.0	6.97	7.0	2.02	2.0	647
2.38	0.06	0.46	1.05	3.95	4.1	2.72	3.50	0.69	6.91	5.0	6.22	4.0	[1]6.39	6.0	505
1.43	0.10	1.05	1.30	3.88	4.1	5.69	2.15	0.81	8.65	8.0	7.84	7.0	6.28	6.0	810
0.86	0.09	0.58	1.63	3.16	3.3	4.52	1.94	0.51	6.97	7.0	6.46	6.0	10.22	10.0	342
0.12	0.36	0.43	0.70	1.61	1.6	5.19	2.69	0.81	8.69	8.0	7.88	7.0	3.92	4.0	344
1.08	0.08	0.46	0.88	2.50	2.5	6.51	1.79	0.49	8.79	9.0	8.30	8.0	5.60	6.0	389
1.54	0.08	1.10	1.26	3.98	4.1	5.56	2.35	0.65	8.56	8.0	7.91	7.0	6.72	6.0	506
0.30	0.65	0.75	0.90	2.60	2.5	4.17	2.28	0.50	6.95	7.0	6.45	6.0	9.54	10.0	648
1.27	0.51	0.80	0.95	3.53	3.7	5.60	1.95	0.42	7.97	8.0	7.55	7.0	10.07	10.0	646
1.65	0.10	0.92	1.35	4.02	4.0	3.15	5.14	1.47	9.76	7.0	8.29	5.0	[2]10.06	10.0	809
2.46	0.12	0.43	1.75	4.76	4.0	1.84	6.38	3.28	11.50	11.0	8.22	....	7.56	7.3	469
1.05	0.10	0.84	1.92	3.91	3.3	0.75	6.21	3.39	10.35	9.3	6.96	8.0	9.06	9.0	470
0.69	0.12	0.21	1.21	2.23	2.1	2.99	5.53	3.28	11.80	9.0	8.52	8.0	3.67	3.0	812
0.83	0.10	0.25	1.50	2.68	2.5	5.14	3.69	1.74	10.57	9.0	8.83	8.0	5.55	5.0	818
....	0.28	0.62	2.05	2.95	2.5	2.12	3.88	1.80	7.80	6.0	6.00	5.0	3.82	3.0	507
1.14	1.10	0.21	0.95	3.40	3.3	7.20	1.37	0.68	9.25	9.0	8.57	8.0	[3]10.79	10.0	813
1.44	0.92	0.17	1.47	4.00	4.1	4.07	3.20	2.07	9.34	7.0	7.27	6.0	5.62	5.0	814
....	0.26	0.62	2.79	3.67	3.3	4.80	1.99	0.51	7.30	7.0	6.79	6.0	5.31	5.0	816
1.17	0.08	0.22	2.25	3.72	3.3	0.10	5.99	4.45	10.54	7.0	6.09	5.0	[4]6.93	7.0	815
0.63	0.12	0.25	1.32	2.32	2.1	2.00	5.02	3.10	10.12	7.0	7.02	6.0	5.44	4.5	649

[1] 1.30% potash as muriate, 5.09% as sulphate.

[3] 7.97% potash as muriate, 2.82% as sulphate.

[2] 2.10% potash as muriate, 7.96% as sulphate.

[4] 0.80% potash as muriate, 6.13% as sulphate.

NITROGENOUS SUPERPHOSPHATES.

Station No.	Manufacturer and Brand.	Place of Sampling.	Dealers' average cash price per ton.	Valuation of the Plant Food in one ton, see p. 5.	Percentage difference between cost and valuation.
	Sampled by Station Agent:				
	The Wilcox Fertilizer Co., Mystic, Conn. *(Continued.)*				
817	Potato, Onion and Vegetable Phosphate	Norwich	$36.00	$27.72	29.9
811	Special Superphosphate	Westchester	26.00	15.82	64.4
	S. D. Woodruff & Sons, Orange, Conn.				
346*	Home Mixture	Orange	31.00	....	....
	Sampled by Purchasers and others:				
213	Berkshire Tobacco Special with Carbonate Potash	*Thompsonville:* James Gamble	36.00	29.00	....
282	Bowker's Tobacco Ash Elements	*Suffield:* Bissell-Graves Co.	32.50	22.24	....
121	Rogers' H. G. Fertilizer for Oats and Top Dressing	*Granby:* J. B. Cannon	44.50	37.61	....
120	Rogers' Soluble Tobacco Manure	*Granby:* J. B. Cannon	43.50	35.20	....
629	Sanderson's Grass and Grain	*Shelton:* O. G. Beard	38.00	25.31	....
436	Shay's Potato Fertilizer	*Colchester:* H. London	31.00	26.99	....
437	Shay's Corn Fertilizer	*Colchester:* H. London	26.00	21.08	....
509	Shay's Special	*Manchester:* C. R. Burr & Co.	40.00	35.80	....

* See note, p. 57.

VALUATION.

The method and meaning of valuation is explained on pages 3 to 7 and the table of trade values will be found on page 6.

It must be remembered that "valuation" as used in this report ***is not a valuation of the brand in question but of the nitrogen, phosphoric acid and potash in it;*** that is, it shows approximately what the same amounts of these ingredients as are contained in a ton of the mixed fertilizer would cost, unmixed, for cash, at freight centers in this State, in their unground and unmixed condition. To make a fair valuation of the manufactured fertilizer itself would necessitate adding to our valuation the

ANALYSES AND VALUATIONS—*Concluded.*

Nitrogen.						Phosphoric Acid.							Potash.		
				Total Nitrogen.					Total.		So-called "Available."				
In Nitrates.	In Ammonia.	Organic, water-soluble.	Organic, water-insoluble.	Found.	Guaranteed.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Found.	Guaranteed.	Found.	Guaranteed	Found.	Guaranteed.	Station No.
1.16	0.14	0.22	1.98	3.50	3.3	7.05	2.35	0.45	9.85	9.0	9.40	8.0	[1]7.64	7.0	817
0.09	0.12	0.19	1.08	1.48	1.0	1.95	6.22	3.52	11.69	9.0	8.17	8.0	2.52	2.0	811
1.72	0.08	0.27	1.66	3.73	3.3	4.01	2.84	1.36	8.21	8.0	6.85	....	8.27	8.0	346
0.61	0.05	4.16		4.82	4.5	0.18	3.23	0.27	3.68	4.0	3.41	3.0	[3]5.73	5.5	213
....	....	....	....	....	....	1.10	5.99	1.57	8.66	9.0	7.09	6.0	[2]15.30	15.0	282
3.66	0.25	2.31		6.22	6.3	1.62	6.72	1.19	9.53	9.0	8.34	7.0	10.15	7.5	121
1.75	0.34	3.03		5.12	5.0	0.39	6.61	0.88	7.88	7.0	7.00	5.0	[4]10.50	10.5	120
2.31	0.10	0.40	0.71	3.52	4.0	5.47	3.15	0.50	9.12	....	8.62	7.0	6.47	7.0	629
0.98	0.16	1.09	1.83	4.06	3.5	3.14	4.63	0.93	8.70	8.0	7.77	7.5	6.15	6.0	436
0.14	0.10	0.78	1.88	2.90	....	4.78	3.28	0.63	8.69	....	8.06	....	3.54	....	437
1.64	0.14	1.97	2.16	5.91	5.8	0.36	5.10	0.99	6.45	8.0	5.46	....	11.10	10.0	509

[1] 6.78% potash as muriate, 0.86% as sulphate. [2] 1.20% potash as muriate, 14.10% as sulphate.
[3] 0.70% potash as muriate, 0.85% as sulphate, 4.18% as carbonate. [4] 1.16% potash as muriate, 9.34% as sulphate

average cost of mixing and bagging, bags, shrinkage, cost of storage, selling, collecting, freight, etc., items which would probably aggregate $8.00 to $12.00 per ton.

PERCENTAGE DIFFERENCE

shows the percentage excess of the cost price over the average cost at freight centers of the nitrogen, phosphoric acid and potash contained in the fertilizer: that is, the percentage amount which is added to the cost of the raw materials as the cost of manufacture and sale.

Nitrogenous Superphosphates Sampled by Purchasers.

Here are included eight analyses of samples sent by individuals. The Station is not responsible for the accuracy of the sampling.

HOME MIXTURES.

In the table, page 86, are given analyses of sixteen fertilizers and the formulas by which they were mixed, as stated by their owners. Two of the mixtures were made in factories, the others were made on the farm.

Obviously, there is a mistake in the formula given or in the mixing of **642**, not mixed by the purchaser, for a mixture with 383 pounds of muriate of potash in the ton would contain at least 8.0 per cent. of potash, while this sample has only 0.49. The same thing is true of **593**. Four hundred pounds of double sulphate of potash in the ton should give at least 5.0 per cent. of potash instead of 1.58 per cent.

In the other cases the actual analysis agrees fairly with the analysis as calculated from the formula.

With few exceptions, these fertilizers are of high grade; i. e., they contain relatively high percentages of nitrogen, phosphoric acid and potash.

The average percentage composition of the whole number is

Nitrogen as nitrates	2.13
Organic nitrogen	2.10
Total nitrogen	4.23
"Available" phosphoric acid	8.13
Potash	7.82

As to the cost of plant food in these home-mixtures the facts are:

In less than car-lots, delivered, one person bought the chemicals and made two mixtures, of which the average cost *for chemicals alone* was $32.75 and the valuation $33.69.

In car-lots, delivered, one person made two mixtures, of which the average cost and valuation *for chemicals alone* were $24.76 and $29.01 respectively.

Another made five mixtures, for which the average cost and valuation were $27.72 and $27.71 respectively.

Two other individuals bought (whether in car-lots or in smaller quantities is not stated) for $28.29 and $36.42 respectively and the valuations were $28.94 and $30.28 respectively.

Another bought two mixtures made on his formula at factories, of which the average cost was $39.27 and valuation $36.49.

C. I. Stone reports the actual cost to him of mixing and bagging a ton of fertilizer as seventy-eight cents. This probably does not include cost of bags as the bags holding the chemicals could be used for the mixture. Allowing an average of $1.50 per ton for mixing and bagging, those who bought their raw materials in mixed car-lots for cash got the mixture at a price which was quite close to the valuation of the ingredients, and in no case more than $2.50 above the valuation. The same is true in several other cases.

Most of the samples were quite fine and dry enough to spread with a drill or fertilizer sower. None were coarser than some of the factory mixtures.

It is quite clear that men with good business sense, who can buy their fertilizer chemicals for cash, in mixed car-lots and mix them before the season opens, can usually save money by doing it.

Those farmers who buy only a small amount of fertilizer, or who are not prepared to make cash payment, or to determine some time in advance what kind of plant food they need and how much, are not likely to make a success of home-mixing.

With a system of coöperative buying and better rural banking facilities, more farmers could profitably buy chemicals and mix for themselves.

In comparing the cost of home-mixed with factory-mixed fertilizers, it must be remembered that the ruling prices of the latter necessarily cover, not only the fair price of the mixtures, but also a charge for doing the banking business of the purchasers. For example, in the majority of cases, the fertilizer manufacturer who sells a ton of fertilizer for $33, waits several months, often nine to twelve months, for his pay. That $33.00, or the larger part of it, he has borrowed at his bank, paying perhaps five per cent. interest, giving security to the bank and meeting his note the day it is due. So to the price which would yield him a fair profit if the goods were sold for cash he is compelled to add an amount which will fully cover the interest he is forced to pay and the occasional failures of buyers to pay within the time agreed upon. He who buys on time forces the seller to do two separate kinds of business for him, make his fertilizer and be his banker.

HOME MIXTURES—FORMULAS.

Station No.	Made by or for	Formula.										
		Nitrate of Soda.	Dried Blood.	Ground Bone.	Tankage.	Dried Fish.	Blood, Bone and Meat.	Guano.	Acid Phosphate.	Muriate of Potash.	Sulphate of Potash.	Double Manure Salt.
460	E. J. Ayres, North Franklin, No. 1 for Grass	400	...	500	350	...	...	...	400	350	...	...
461	E. J. Ayres, North Franklin, No. 2 for Potatoes	200	...	600	400	...	...	...	400	400	...	...
508	H. E. Clark, Middlebury, Grass Mixture	400	300	900	...	...	...	...	...	...	400	...
306	Conn. School for Boys, Meriden, Grass	500	...	...	500	...	...	...	400	[4]250	...	...
307	Conn. School for Boys, Meriden, Vegetable	100	...	...	750	...	...	...	750	200	200	...
642	H. W. Ferry, So. Glastonbury	333	...	...	...	...	...	333	1000	333	...	...
464	Gaylord Farm, Wallingford, Garden	200	100	...	...	600	...	...	850	...	250	...
465	Gaylord Farm, Wallingford, Orchard	200	...	...	...	...	600	...	[3]500	...	...	200
463	Gaylord Farm, Wallingford, Orchard and Corn	...	...	...	...	...	1000	...	500	...	...	500
466	Gaylord Farm, Wallingford, Potatoes	250	300	...	...	300	...	...	750	...	...	400
181	Wilber Hills, Wapping	300	...	...	1300	...	...	...	...	400	...	...
593	A. E. Phelps, Glastonbury	...	...	[2]400	...	...	...	[1]1200	...	...	400	...
546	C. I. Stone, Marion, Grass	534	...	...	...	...	...	...	1180	286	...	...
317	W. M. Whitcomb, W. Cheshire	500	...	200	...	...	...	...	900	400	...	...
561	W. L. Merwin, Milford	...	...	...	...	600	...	...	400	...	...	[5]1000
462	C. Z. Murdock, Meriden	500	...	[2]500	500	...	...	...	...	500	...	...

[1] Cotton seed meal. [2] Precipitated bone. [3] And 500 lbs. basic slag. [4] And 350 lbs. kainit. [5] Kainit.

VI. MISCELLANEOUS FERTILIZERS.

LIMESTONE.

Here are included the nearly pure lime carbonate and also the double carbonate of lime and magnesia known as dolomite. From both of these, "burned lime" or "quick lime" is prepared, both for building purposes and also (particularly when its color is poor or it has been imperfectly burned) for agricultural use. The following analyses of ground and unground limestone show its usual composition.

HOME MIXTURES—ANALYSES.

Station No.	Nitrogen.					Phosphoric Acid.					
	In Nitrates.	In Ammonia.	In Water-soluble organic.	In Water-insoluble organic.	Total.	Water-soluble.	Citrate-soluble.	Citrate-insoluble.	Total.	Potash.	Cost per ton.
460	3.06	0.05	0.19	1.66	4.96	2.41	5.93	2.61	10.95	11.83	[8]$33.50
461	1.46	0.05	0.54	1.60	3.65	2.82	7.53	3.25	13.60	10.69	[8]32.00
508	2.92	0.20	0.98	1.14	5.24	0.07	9.23	4.75	14.05	[1]8.91	[9]37.15
306	3.52	0.07	0.72	1.03	5.34	1.35	3.99	1.11	6.45	9.08	[10]26.88
307	0.83	0.07	0.88	1.53	3.31	3.49	4.97	2.11	10.57	[2]7.93	[10]22.65
642	3.08	0.13	0.08	0.15	3.44	5.88	5.39	1.73	13.00	0.49	35.00
464	1.59	0.19	0.37	2.31	4.46	3.12	4.06	1.70	8.88	[3]7.30	[10]31.30
465	1.48	0.06	0.77	1.15	3.46	1.18	6.34	3.62	11.14	[4]3.58	[10]24.15
463	0.18	0.11	0.22	2.78	3.29	2.24	4.17	1.94	8.35	[5]8.07	[10]26.25
466	1.99	0.12	0.55	1.74	4.40	4.41	2.46	1.14	8.01	[6]6.24	[10]29.18
181	2.33	0.02	2.60		4.95	0.26	10.93	2.26	13.45	10.08	[9]41.40
593	0.23	0.10	0.06	3.85	4.24	0.86	6.01	0.50	7.37	[7]1.58	....
546	4.06	0.00	0.12	0.02	4.20	7.41	1.67	0.67	9.75	7.92	[11]28.29
317	3.70	0.03	0.38		4.11	4.86	3.89	0.96	9.71	10.20	[11]36.42
561	......	0.19	0.24	2.16	2.59	1.30	2.94	1.38	5.62	7.73	25.00
462	3.60	0.08	0.54	1.85	6.07	1.11	9.04	0.15	10.30	13.56	....

[1] 0.80% as muriate, 8.11% as sulphate.
[2] 7.31% as muriate, 0.62% as sulphate.
[3] 0.97% as muriate, 6.33% as sulphate.
[4] 0.90% as muriate, 2.68% as sulphate.
[5] 1.59% as muriate, 6.48% as sulphate.
[6] 1.22% as muriate, 5.02% as sulphate.
[7] 0.60% as muriate, 0.98% as sulphate.
[8] Less than car lots unmixed delivered.
[9] Delivered mixed.
[10] Car lots unmixed delivered.
[11] Home mixed delivered.

682. Sent by W. F. Tomlinson, F. D., of Danbury.

680 and **681.** Sent by W. H. Seeley, Boston,

615 and **616.** Sent by W. T. Coe & Son, Northford.

630. Sent by E. B. Clark Seed Co., Milford.

358. Sold by the Stearns Lime Co., Danbury. Sent by F. Howard Ensign, East Hartford.

140. Sent by J. F. Merrell, Suffield.

438. Sent by Plumtree Lime Co., Danbury.

ANALYSES OF LIMESTONE.

Station No.	682	680	615	681	630	358	616	140	438
Lime	55.80	55.20	54.04	52.26	48.96	44.01	42.70	33.36	30.78
Magnesia	0.18	0.30	0.54	1.91	1.22	1.21	1.60	19.24	21.14
Equivalent Carbonate of Lime	99.64	98.57	96.50	93.32	87.43	78.60	76.25	59.57	54.96
Carbonate of Magnesia	0.36	0.63	1.13	4.01	2.56	2.54	3.36	40.40	44.39
Other matters by difference*	.00	0.80	2.37	2.67	10.01	18.86	20.39	0.03	0.65
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Chemically pure limestone contains 56 per cent. of lime (the oxide of a metal calcium which does not occur in nature and is of no use in the arts) and 44 per cent. of carbonic acid. **682** and **680** are very nearly pure. **615** and **681** are nearly pure but contain over 2 per cent. of other and insoluble minerals. **630**, **358**, and **616** contain very considerable amounts of other minerals which are associated in nature with the carbonate and cannot be removed. **140** and **438** are dolomites, or magnesian limestones containing about 20 per cent. of magnesia replacing lime.

The Stearns Lime Co. of Danbury sell two grades of ground limestone, "Ten mesh" and "Forty mesh." These terms signify sieves with ten meshes or forty meshes to the linear inch. Fineness of product will of course depend on the thickness of the wire of which the sieve is made. Samples of the two grades, kindly sent by the company, have been screened through standard sieves with the following results:

	Ten Mesh Limestone.	Forty Mesh Limestone.
Coarser than 20 mesh	14	0
Between 20 and 30 mesh	17	11
" 30 " 40 "	8	9
" 40 " 50 "	3	6
" 50 " 80 "	10	15
" 80 " 200 "	14	18
Finer than 200 mesh	34	41
	100	100

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* Chiefly matter insoluble in acid.

BURNED OR QUICK LIME.

A single sample, **139**, made by the Lee Lime Co., Lee, Mass., sampled and sent by J. F. Merrell, Suffield, cost $4.00, in car lots at the kiln. It contained

Lime	51.48
Magnesia	36.34
Insoluble matter	3.33
Free and combined water	8.85
	100.00

This is made from magnesian limestone by roasting in a kiln which drives off the carbonic acid as a gas and leaves lime and magnesia (calcium and magnesium oxides).

If we allow $2.00 for freight, lime and magnesia together cost, delivered, about 34 cents per 100 pounds in car lots.

SLAKED LIME.

Burned lime like the sample described has a great avidity for water and absorbs it rapidly from the air or if sprinkled with water combines with it quickly, developing great heat. There is formed slaked lime which is a hydrate and contains when pure about 75.7 per cent. of lime. Burned lime also combines with carbonic acid again to form carbonate of lime, with only 56 per cent. of lime.

The slaked limes of commerce are mixtures of hydrate and carbonate. The following analyses show the usual range of composition.

3. Sold by the Farnams Lime Co., Farnams, Mass. Sent by J. W. Alsop, Avon.

617. Air-slaked. Sent by W. T. Coe & Son, Northford.

182. Agricultural Lime from Farnams-Cheshire Lime Co. Sent by B. W. Rothe, Rockville.

638. Patent Process Fertilizer Lime. Sold by Walton Quarries, Harrisburg, Pa. Stock of John Hesser, Killingworth.

131. Agricultural Lime from Farnams Lime Co. Sent by F. E. Peckham, Norwich.

4. Agricultural Lime from Farnams Lime Co. Sent by H. K. Brainard, Thompsonville.

ANALYSES OF SLAKED LIME.

Station No.	3	617	182	638	131	4
Lime	65.64	65.20	62.88	61.32	60.56	60.14
Magnesia	0.82	0.86	1.59	6.64	0.93	1.06
Insoluble in acid	.....	1.81	1.66	4.21	1.65	.....
Cost per ton,	$3.50*	.....	4.00*	18.00	5.85	8.50
Lime-magnesia costs cents per 100 lbs.	.40†	.....	.46†	1.33	.47	.69

Samples **3**, **182**, **131**, were bought at about the ruling rates. Anything over $6.00 per ton for slaked lime, delivered, is not economical. Special attention is called to the "patent process" lime. This is a fine slaked lime, no better for agricultural use than the other samples. It has, however, been sold to a number of farmers in this state for $18.00 per ton, or just about three times as much as need be paid for lime which is quite as valuable agriculturally.

SHELL MARL LAND LIME.

215. Sold by the Vermont Marl Co., Brattleboro, Vt. Sampled and sent by Jared Bishop, Cheshire.

It contained 51.62 per cent. of lime and 0.51 per cent. of magnesia, both chiefly in form of carbonate.

WOOD ASHES AND WOOD ASHES SUBSTITUTES.

578. Bowker's Wood Ashes, from Bowker Fertilizer Co. Stock of Lightbourn and Pond, New Haven.

524. Canada Ashes from John Joynt, Lucknow, Ont. Stock of H. G. Church, South Windsor.

683. Hardwood Ashes, sold by W. L. Mitchell, Houlton, Me. Sent by Keiser and Boasberg Plantation, Inc., East Windsor Hill.

529. Wood Ashes, sold by Olds & Whipple, Hartford. Stock of W. C. George, Warehouse Point.

927. Unleached Wood Ashes imported by Geo. L. Munroe & Sons, Oswego, N. Y. Guaranty, 1 per cent. potash, 0.50 phosphoric acid, 25.0 per cent. lime. Sampled and sent by F. W. Judson, Watertown.

570. Lime and Ashes. Sent by W. A. Reed, Meriden.

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* At kiln. † Adding $1.85 freight.

214. Wood Ashes Substitute, sold by the Vermont Marl Co., Brattleboro, Vt. Sample sent by John Bishop, Storrs.

26. Ashes from a Meriden factory. Sampled and sent by W. H. Lyon, Meriden.

The collection is a typical one. The cost given for **578** is probably what is charged for small amounts for lawns, etc.; the other prices are for car lots.

One lot of hardwood ashes, **683,** has about the composition which clean, dry, hardwood ashes should have. Allowing 4 cents per pound for phosphoric acid and 4¼ for potash, the lime and magnesia in these ashes costs 45 cents per 100 lbs., which is not excessive.

Of the other four samples of "wood ashes," more than one-third of one and more than one-half of two others consists of water, sand, coal and other useless ballast.

ANALYSES OF WOOD ASHES, ASHES SUBSTITUTES, ETC.

Station No.	578	524	683	529	927	570	214	26
Percentage amounts of								
Water-soluble potash	2.91	1.35	6.92	2.40	3.00	0.18	5.66	0.21
Phosphoric acid	1.30	0.87	2.78	0.95	1.24	0.19	1.59	0.32
Lime	26.04	24.77	34.15	16.48	31.54	38.86	42.03	3.99
Magnesia	2.60	1.41	3.27	2.18	....	0.74	0.85	0.82
Water	6.76	37.82	2.62	13.55	....	1.66	1.10	9.05
Charcoal	27.82	10.03	13.00	40.09	12.37	25.49	6.35	80.35
Insoluble in acid								2.32
Cost per ton	$18.00*	13.75	11.50	11.75	11.00	....	15.00	....

The cost of lime and magnesia, calculated as above, is in **524,** $1.56, in **529,** $2.89, and in the wood ashes substitute, **214,** $1.04, per 100 pounds. Lime and magnesia can readily be bought in ground limestone, pulverized burned lime or slaked lime for 50 cents per 100 pounds, or less.

HEN MANURE.

129. Sent by E. L. Ford, Jr., Milford, represents material gathered each week from the hen houses and stored in a bin under cover.

It contained water 51.7, nitrogen 2.88, phosphoric acid 1.15, and potash 1.18 per cent.

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* Retail in small lots for lawns.

SHEEP MANURE.

619. Pulverized Sheep Manure, sold by American Agric. Chem. Co., New York City; sampled from stock of Greenwich Hardware Co., Greenwich.

373. Sheep's Head Brand Pulverized Sheep Manure, sold by Natural Guano Co., Aurora, Ill.; sampled from stock of F. S. Platt Co., New Haven.

374. Sheepino Natural Guano, sold by Niantic Menhaden Oil and Guano Co., South Lyme; sampled from stock of J. P. Barstow and Co., Norwich.

377. Wizard Brand Manure, sold by Pulverized Manure Co., Chicago; sampled from stock of F. S. Platt Co., New Haven.

	619	373	374	377
Nitrogen in nitrates			0.42	
" " ammonia	0.17	0.20	0.10	0.45
" organic, water-soluble	0.54	0.37	0.06	0.27
" " active insoluble	0.59	0.42	0.28	0.36
" " inactive insoluble	1.35	1.56	0.76	1.32
Total nitrogen found	2.65	2.55	1.62	2.40
" " guaranteed	2.06	2.25	1.50	1.80
Water-soluble phosphoric acid	0.86	1.02	0.23	0.99
Citrate-soluble " "	0.12	0.05	0.91	0.37
Citrate-insoluble " "	0.18	0.18	0.28	0.12
Total phosphoric acid found	1.16	1.25	1.42	1.48
" " " guaranteed	0.50	1.50	1.00	4.00
Potash found	1.82	1.88	4.26	1.85
" guaranteed	0.50	1.50	4.00	1.00
Cost per ton	$30.00	30.00	38.00	30.00

377. Wizard Brand contains much less phosphoric acid than is guaranteed. The percentage of potash in **374**, Sheepino Natural Guano, is much higher than is ordinarily found in dry sheep manure.

TOBACCO SIFTINGS.

No. **9** received from H. K. Brainard, Thompsonville, contained the following percentages:

Nitrogen of nitrates 0.25, of ammonia 0.24, nitrogen organic 171. Total nitrogen 2.20, phosphoric acid 0.64, potash 2.63.

Tobacco stems, with which this may be compared, contains on the average,

Total Nitrogen	2.05
Phosphoric Acid	0.60
Potash	7.54

"CLAY DEPOSIT."

70. Sent by Geo. H. Pearson, Bethel. A deposit in a vein several feet deep in the bed of a stream.

It is a fine silt, but contains no clay nor diatoms. Apparently it is largely an iron and alumina silicate.

Insoluble in acid	56.35
Oxide of iron and alumina	22.88
Lime	4.50
Magnesia	2.45
Water at 100°	9.28
Undetermined	4.54
	100.00

PART II.

Seventeenth Report on Food Products and Fifth Report on Drug Products, 1912.

BY JOHN PHILLIPS STREET.*

This station is required by law to make examinations of food and drug products, to publish its findings, and to report to the dairy and food commissioner all cases of adulteration or misbranding which are discovered. Under this law a large number of samples of food and drugs have been bought in various parts of the state and carefully examined, and cases of adulteration or misbranding reported to the commissioner. The station has no power of prosecution, its duty being to determine the facts and supply expert testimony in case of prosecution.

Of the 496 samples collected by the station agent, 253 were passed, and 92 were adulterated, below standard or misbranded. Eighty-five of these 92 were reported to the commissioner, and 45 second samples of these brands were bought by his agents of the same dealers, and sent to the station for analysis. Of these 28 were adulterated or misbranded. The dairy and food commissioner has also sent 712 samples, chiefly milk, molasses, sausage, butter and turpentine. These will be briefly discussed, leaving the full details and the results of prosecution to be given in the commissioner's report. Of these samples 344 were adulterated, misbranded, or below standard. To summarize: Of 757 samples taken by the commissioner under the law, 372 were found to be either adulterated, misbranded or below standard. The station has been called on for court testimony in seventeen instances. Besides the above, 288 samples were examined for the commissioner in connection with a study of net weight and volume of package goods and a number of samples of food and drug products have been examined for individuals, which will likewise receive brief mention.

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* The analytical work herein reported was done jointly with E. M. Bailey, C. B. Morison, R. B. Roe and C. E. Shepard.

I. FOOD PRODUCTS.

CANNED CORN.

The present examination was undertaken primarily to study completeness of fill and net weight of contents in connection with the net weight and measure law recently enacted in this state. The chemical work was limited to a determination of dry matter and testing for presence of saccharin.

The average composition of 42 samples of canned corn analyzed by McElroy & Bigelow* was as follows:

Water	75.50
Ether Extract	1.28
Crude Fiber	.80
Ash (-NaCl)	.47
Sodium Chloride	.36
Protein	2.84
Carbohydrates	18.75

Fresh sweet corn contains about 73 per cent. of water. The only ingredients generally added in canning are about 5 per cent. of water, and small quantities of salt and sugar. A properly filled No. 2 can of corn should contain about 21 ozs. of material. Disregarding the small amounts of added salt and sugar and assuming that 5 per cent. of water has been added, the can should contain about 473 gms. of water and 122 gms. of dry matter, or 79.5 and 20.5 per cent., respectively. As the addition of salt and sugar would reduce the percentage of water content, it is apparent that under the usual methods of canning a No. 2 can of corn should not contain more than 473 gms., or 79.5 per cent. of water; in fact with the best methods of practice the amount of water would undoubtedly be less.

With one exception, No. **27896**, the net weight of all of the 36 samples here reported varied within quite narrow limits from 571 to 614 gms., average 594 gms. Thirty-one contained 581 gms. or over, that is, within 0.5 ozs. of the standard fill of 21 ozs. The weight and percentage of water found in the samples may be summarized as follows:

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* U. S. Dept. Agl., Bur. of Chem., Bull. 13, pt. 8, 1126.

No. of Samples.	Gms. Water.	No.	Per Cent. Water.
5	446-455	4	75.2-76.6
9	456-465	9	76.8-78.3
10	466-473	11	78.5-79.5
9	474-480	6	79.6-80.8
3	481-496	6	81.0-83.0

Twelve of these samples, therefore, probably contain an excessive amount of water. They contain from 95 to 122 gms. of dry matter per can, average, 112 gms., as compared with from 121 to 149, average, 133 gms., in the other twenty-four samples.

According to Bitting* the can should be filled within ⅜ in. of the top. In our samples the air space was ⅜ in. in 12, ½ in. in 17, ⅝ in. in 6, and ¾ in. in 1. In seven samples, therefore, there was a tendency towards short fill, but inasmuch as in these samples the net weights of contents were 614, 591, 585, 593, 579, 577 and 592 gms., the deficiency was more apparent than real, and is probably largely due to slight variations in the dimensions of the cans rather than to any shortage of corn.

Six of the cans showed no corrosion, eleven traces, thirteen slight, five considerable and one much.

No saccharin was found in any of the samples.

The retail cost of the corn ranged from 7 to 16 cents per can, average 12 cents. Of course price depends to a considerable extent on quality, a matter not specially studied in this report.

DRIED FRUITS.

The examination of the one hundred and two samples of dried fruits was undertaken primarily to study the variations in weight of dried fruits sold in package form, and the losses in weight after keeping for several months. The results of these studies are given in Bulletin 172 of this station. Incidentally some chemical data were secured which are here published together with a full description of the samples. The changes in weight shown during storage are given in detail, but the discussion in the bulletin referred to above will not be repeated.

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* Bur. of Chem., Bull. *151*, 50.

TABLE I.—

Station No.	Manufacturer, or Jobber, and Brand.
27649	Austin, Nichols & Co., New York. Extra Quality Cream Brand Sugar
27822	The Baxter Bros. Co., Brunswick, Me. Sterling Brand Standard Grade Sugar
27622	A. F. Beckmann & Co., New York. Gold Rock Brand Sweet Tender
27644	The Burt Only Canning Co., Oneida, N. Y. Holiday Brand Sweet
27906	" " " " Nectar Brand Sweet
27821	" " " " Rose of Sharon Brand Sweet
27949	The F. C. Bushnell Co., New Haven. Northern Queen Brand Sweet Sugar
27611	Lewis DeGroff & Son, New York. Health Brand Sweet
27693	The Fame Canning Co., Tipton, Ind. Fame Brand Sugar
27961	The R. N. Fitz Gerald Co., Hartford. Mascot Brand Fancy Maine
27674	Henry L. Forhan, Portland, Me. Forhan's Square Brand Fancy Maine Sugar
27793	Henry L. Forhan, Portland, Me. Forhan's Square Brand Fancy Maine Sugar
27966	Henry L. Forhan, Portland, Me. Lake Brand Maine Sugar
27806	" " " Sundrop Brand Sugar
27943	Fort Stanwix Canning Co., Rome, N. Y. Flag Brand Sweet Kernel Finest Quality
27800	The Wm. M. Geer Co., New York. Half Moon Brand Fancy
27619	Great Atl. & Pacific Tea Co., Jersey City, N. J. Iona Brand
27916	Francis H. Leggett & Co., New York. Premier Brand
27898	Miner, Read & Tullock, New Haven. Sphinx Brand Sugar
27995	R. H. Nesbit Co., New Haven. Fancy Maine Sugar
27996	Oswego Preserving Co., Oswego, N. Y. Magnet Brand Sweet Standard Quality
27925	Oswego Preserving Co., Oswego, N. Y. Silver Key Brand Standard Quality Sugar
27923	Portland Packing Co., Portland, Me. Red Top Brand Maine Finest Sugar First Quality
27666	Preston Canning Co., Preston, Md. Crown of Maryland Brand Sugar
27903	Thos. Roberts & Co., Philadelphia. Northern Queen Brand Sweet Sugar
27945	Saco Valley Canning Co., Portland, Me. Fairfield Brand Sugar
27612	" " " Falmouth Brand Sugar
27610	Seeman Bros., New York. White Rose Baby Brand
27692	R. F. Smith, Norwich. Shetucket Brand Sugar
27924	Sprague, Warner & Co., Chicago. Richelieu Brand
27893	H. F. Webb Co., Portland, Me. White Cross Maine Sugar Fine Quality
27676	R. C. Williams & Co., New York. Famous Royal Scarlet Brand Evergreen
27820	Wilson Canning Co, Mexico, N. Y. Lily Brand Sweet
27905	Winters & Prophet Canning Co., Mount Morris, N. Y. Empire Sweet First Quality
27922	Winters & Prophet Canning Co., Mount Morris, N. Y. Revere Brand Sweet First Quality
27896	A. F. York, Yarmouthville, Me. Maine Standard
	Maximum
	Minimum
	Average

CANNED CORN.

Cost per Can.	Dry Matter per Can.	Gross Weight.	Weight of Can.	Net Weight of Contents.	Completeness of Fill (Air-space).	Corrosion of Can.	Water.	Dry Matter.
cts.	gms.	gms.	gms.	gms.	in.		%	%
9	118	724	110	614	5/8	Sl.	80.76	19.24
12	130	702	98	604	3/8	Tr.	78.45	21.55
12	122	692	103	589	1/2	Sl.	79.24	20.76
15	138	710	103	607	3/8	Cons.	77.31	22.69
10	146	689	97	592	1/4	Sl.	75.40	24.60
12	140	703	100	603	1/2	"	76.73	23.27
10	120	697	102	595	1/2	Tr.	79.81	20.19
15	138	713	105	608	3/8	"	77.31	22.69
10	117	703	102	601	3/8	Cons.	80.46	19.54
15	135	689	98	591	5/8	Tr.	77.20	22.80
13	131	686	101	585	5/8	Sl.	77.59	22.41
10	108	693	107	586	1/2	None.	81.65	18.35
10	117	680	99	581	1/2	Sl.	79.94	20.06
10	135	712	100	612	3/8	"	77.91	22.09
10	147	693	100	593	5/8	"	75.20	24.80
12	121	680	101	579	5/8	None.	79.12	20.88
10	122	680	103	577	5/8	Tr.	78.88	21.12
13	127	710	104	606	3/8	None.	79.02	20.98
10	128	702	100	602	1/2	Cons.	78.80	21.20
15	128	699	104	595	1/2	Tr.	78.46	21.54
12	130	702	101	601	3/8	Much.	78.41	21.59
10	135	703	101	602	1/2	Cons.	77.62	22.38
15	109	686	101	585	3/8	Sl.	81.40	18.60
8	122	700	104	596	1/2	Tr.	79.58	20.42
7	113	691	100	591	1/2	Sl.	80.94	19.06
10	109	698	99	599	3/8	Tr.	81.82	18.18
12	112	677	99	578	1/2	Cons.	80.67	19.33
16	144	695	105	590	1/2	Tr.	75.66	24.34
13	121	685	103	582	1/2	None.	79.17	20.83
15	108	670	99	571	1/2	Tr.	81.08	18.92
13	149	713	103	610	3/8	None.	75.56	24.44
13	127	699	101	598	3/8	Sl.	78.80	21.20
12	126	680	96	584	1/2	Tr.	78.39	21.61
15	122	695	100	559	3/8	Sl.	79.55	20.45
15	132	690	99	591	1/2	None.	77.71	22.29
10	95	662	102	560	1/2	Sl.	83.04	16.96
16	*149*	*724*	*110*	*614*	3/4	....	*83.04*	*24.80*
7	*95*	*662*	*96*	*560*	3/8	....	*75.20*	*16.96*
12	*126*	*694*	*101*	*593*	1/2	....	*78.85*	*21.15*

TABLE II.—DRIED

Station No.	Manufacturer and Brand.
	Apples.
27931	American Fruit Product Co., Rochester, N. Y. Choice Evap. King Apples
27608	Austin, Nichols & Co., New York. Hudson Brand Evap. Apples..........
27885	Bown Bros., Despatch, N. Y. Star Brand Evap. Apples................
28002	W. T. Gaylord, Jr., Sodus, N. Y. Snow Flake Choice Evap. Apples ......
27829	W. T. Gaylord, Jr., Sodus, N. Y. Snow Flake Choice Evap. Apples ......
27984	Gold Medal Brand Evap. Apples, Baldwin's..........................
27909	Hartmann & Burns, Rochester, N. Y. Gold Ribbon Brand Choice Evap. Apples..
27913	Hartmann & Burns, Rochester, N. Y. York State Brand Evap. Apples.....
27501	Wm. A. Higgins & Co., New York. Chariot Evap. Apples ....
27743	J. J. Smith, Newark, N. Y. Perfection Brand Extra Choice Evap. Apples..
27799	J. J. Smith, Newark, N. Y. Choice Perfection Brand Evap. Apples ....
27908	A. B. Williams Fruit Co., Sodus, N. Y. Puritan Brand Extra Fancy Evap. Apples..
	Apricots.
28001	The F. C. Bushnell Co., New Haven. Butter-nut Fancy Evap. Apricots...
27883	R. C. Williams & Co., New York. Famous Royal Scarlet Brand Fancy Apricots..

Apples.

Eight of the twelve samples of apples were labeled "Sulphured." In only two samples could sulphur dioxide be detected, the amounts present being 1.2 and 0.9 mgm. per 100 gms. of fruit. The absence of sulphurous acid or the presence of these very small quantities is explained by the fact that apples are dried with artificial heat, and after bleaching with the fumes of burning sulphur the drying is effected so quickly that the sulphurous acid dextrose compound is rarely formed and even if formed generally disappears completely during storage. Several of the samples contained noticeable amounts of core, decayed spots, and in one case seeds. Two samples consisted mostly of small pieces and were of inferior quality.

APPLES AND APRICOTS.

Claims of Label.	Net weight.		Days between weights.	Cost per package.	Cost per lb. of fruit, based on 1st net weight.	Remarks.
	At time of purchase.	After days specified.				
	oz.	oz.		cts.	cts.	
Net weight when packed 1 lb.	15.3	13.2	70	14	14.6	
Net weight when packed 16 oz. Sulphur bleached	14.0	12.8	85	18	20.6	Some slightly moldy
"Sulphured" indistinctly stamped	11.0	10.7	71	15	21.8	Some decay; poor condition
Sulphured	13.7	12.4	64	15	17.5	
Sulphured	13.3	10.3	75	12	14.4	Some decay
	12.6	11.9	68	13	16.5	Some decay; many small pieces
Sulphured	13.9	13.0	71	15	17.3	Some decay
Sulphured	13.6	11.1	71	15	17.6	Some decay; many small pieces
	13.4	10.6	91	12	14.3	
	13.4	11.4	79	15	17.9	A good many seeds
Sulphur Processed	12.6	11.2	76	15	19.0	
"Prepared by Sulphur Process which retains all the natural properties of fresh apples"	14.5	13.7	71	20	22.1	
	13.5	12.7	64	18	21.3	57.4 mgms. SO_2 per 100 gms. A few worms; casts; in bad condition
Bleached with Sulphur	15.1	13.6	76	25	26.5	56.7 mgms. SO_2 per 100 gms. Good condition

The apples cost from 12 to 20 cents per package, weighing at time of purchase from 11 to 15.3 ozs., the cost per pound of fruit ranging from 14.3 to 22.1 cents.

Apricots.

Both samples of apricots contained sulphur dioxide, No. **28001**, 57.4 mgms. and No. **27883**, 56.7 mgms. per 100 gms. of fruit; in the former sample the presence of the bleaching agent was not declared on the label. This sample was also in bad condition, containing a few live worms, and many insect casts.

The apricots cost 18 and 25 cents per package, weighing at time of purchase 13.5 and 15.1 ozs., making the cost per pound of fruit 21.3 and 26.5 cents, respectively.

TABLE III.—DRIED CURRANTS.

Station No.	Manufacturer and Brand.	Claims of Label.	Net Weight.		Days between weights.	Cost per package.	Cost per lb. of fruit based on 1st net weight.	Ash.		
			At time of purchase.	After days specified.				Total.	Insoluble in Hcl.	Soluble in Hcl.
			oz.	oz.		cts.	cts.			
27795	Austin, Nichols & Co., New York. Sunbeam Pure Food	Cleaned	15.7	14.5	77	12	12.2	2.19	0.15	2.04
27914	The F. C. Bushnell Co., New Haven. Butter-Nut Brand, Fancy	Cleaned	15.3	14.1	72	12	12.5	1.92	0.06	1.86
28000	Excelsior Brand	Washed	11.1	9.9	65	11	15.9	2.55	0.50	2.05
27825	Gold Medal Brand, Superior	Cleaned	11.6	13.9	76	12	16.6	2.29	0.33	1.96
27642	Great Atlantic and Pacific Tea Co., Jersey City. Grandmother's Brand, A. & P.	Cleaned	16.0	14.7	86	10	10.0	2.50	0.41	2.09
27650	Herald Brand Greek		14.9	14.4	86	10	10.7	3.61	1.61	2.00
27621	Wm. A. Higgins & Co., New York. Chariot	Cleaned	14.4	13.3	87	12	13.3	2.01	0.04	1.97
27661	Wm. A. Higgins & Co., New York. Holly	Cleaned	14.4	12.9	85	10	11.1	2.40	0.40	2.00
27616	The Hills Bros. Co., New York. Dromedary Brand	Cleaned	15.1	14.5	87	10	10.6	2.01	0.25	1.76
27951	The Hills Bros. Co., New York. Dromedary Brand	Cleaned	14.4	14.2	70	15	16.7	1.96	0.09	1.87
27628	The Hills Bros. Co., New York. Royal Excelsior Brand	Perfectly Cleaned	15.0	14.7	87	12	12.8	2.14	0.36	1.78
27710	The Hoover Mercantile Co., New York. Battleship Brand	Cleaned	15.5	14.6	84	12	12.4	2.03	0.21	1.82
27981	The E. S. Kibbe Co., Hartford. Helmet Brand	Perfectly Cleaned, 1 lb.	16.2	15.0	69	13	12.8	2.50	0.32	2.18
27667	Frank P. Kruger, New York. Blue Seal	Cleaned	11.0	10.4	85	9	13.1	2.64	0.52	2.12
27742	Frank P. Kruger, New York. Purity	Cleaned	14.3	13.5	80	12	13.4	2.65	0.51	2.14
27952	Francis H. Leggett & Co., New York. Nabob	Cleaned	14.6	14.4	70	13	14.2	2.21	0.23	1.98
27887	Little Jack Horner Brand, Greek		14.5	13.4	72	12	13.2	2.69	0.64	2.05
27921	Sunflower Brand, Greek	Cleaned	11.4	10.3	71	12	16.8	2.31	0.43	1.88

Currants.

Eighteen samples were examined, all but two being labeled as cleaned or washed currants. Currants are commonly dried on sand, and unless later carefully cleaned may contain considerable mineral impurity. The total ash in the samples ranged from 1.92 to 3.61, average, 2.37 per cent.; the ash insoluble in hydrochloric acid (sand) from 0.06 to 1.61, average, 0.39 per cent.; the ash soluble in hydrochloric acid from 1.76 to 2.18, average, 1.98 per cent. Total ash is hardly a criterion as to the amount of mineral impurity, as the presence of varying amounts of seeds would affect the ash content. Insoluble ash, however, shows very closely the amount of sand. Three samples contained less

TABLE IV.—DATES AND PRUNES.

Station No.	Manufacturer and Brand.	Net weight.		Days between weights.	Cost per package.	Cost per lb. of fruit, based on 1st net weight.
		At time of purchase.	After days specified.			
	Dates.	oz.	oz.		cts.	cts.
27629	Austin, Nichols & Co., New York. Sunbeam Pure Food Golden Dates	16.1*	15.7	144	10	9.9
27878	Austin, Nichols & Co., New York. Sunbeam Pure Food Pitted Dates	12.5†	10.8	133	15	19.2
27613	The Hills Bros. Co., New York. Dromedary Brand Golden Dates	13.3	12.5	144	12	14.4
27659	The Hills Bros. Co., New York. Royal Excelsor Selected Hallowi Dates	10.1	9.3	142	10	15.8
27641	Frank P. Kruger, New York. Purity Brand Persian Dates	12.0	11.2	143	10	13.3
27777	E. A. O'Kelly & Co., Marseille. O'K Dattes Muscades sur Choix	9.2‡	7.3	135	25	43.5
27640	Palmer & Pierce, New York. Orient Brand Golden Dates	11.5	10.8	143	10	13.9
27810	R. C. Williams & Co., New York. Pitted Dates Hallowee, First Quality	10.4	9.4	134	12	18.5
	Prunes.					
26938	The Very Best Prunes Gold Medal Brand Pitted. Santa Clara Co., Cal.	13.5	11.3	150	15	17.8
27881	Lawrence Russell, Saratoga, Cal. Russell Brand Extra Fancy Saratoga Prunes	15.4	13.1	133	17	17.7

* Claimed net wgt. when packed 16 oz.
† Claimed net wgt. when packed 12 oz.
‡ In pasteboard box with loose cover.

than 0.10 per cent., namely, 0.06, 0.04 and 0.09, and show how thoroughly it is possible to clean a high-grade article. Eight samples contained from 0.15 to 0.40 per cent., five from 0.41 to 0.64, and one 1.61 per cent. insoluble ash. The two samples containing the highest percentages were the only ones making no claims for superior cleanliness on the label. Samples containing over 0.25 per cent. of sand cannot justly be called "clean."

TABLE V.—

Station No.	Manufacturer and Brand.	Style of package.
27819	Arguimbau & Ramée, New York. Armée Brand Smyrna Figs.....	Box
27809	" " " Armée Brand Fancy Figs......	Jar
27665	Armée Superbos Brand Extra Fancy Locoums Washed and Conserved Figs..........	Basket
27770	Austin, Nichols & Co., New York. Anco Washed Figs..........	Tumbler
27947	" " " Sunbeam Pure Food Washed Figs..........	Jar
27982	Bengal Brand Washed Figs (Serial No. 14902)..........	"
27660	W. A. Camp & Co., New York. Antler Brand Washed Figs.....	Box
27776	" " " Jester Brand Washed Figs.....	Basket
27988	J. C. Carpenter Fig Co., Houston, Tex. Imperial Skinless Figs..	Jar
27811	Cresca Figs..........	Basket
27805	Guggenhine & Co., California. Pansy Brand California Figs.....	Paper
27918	Hills Bros. Co., New York. Choice Anchor Brand Washed and Conserved Figs..........	Basket
27774	Hills Bros. Co., New York. Coronet Brand Smyrna Figs........	Box
27731	" " " Dromedary Brand Washed and Conserved Figs..........	"
27948	Hills Bros. Co., New York. Liberty Bell Brand Washed and Conserved Figs..........	Basket
27987	Imperial Brand Oriental Washed Figs..........	"
27910	Lesbian Fruit Co. Lesbian Brand Washed Figs Extra Quality...	Box
27880	Antoine Reggio & Co., Smyrna, Turkey. Turkey Brand Figs....	Paper
27775	Rosenberg Bros. & Co., San Francisco, Cal. Sultan Brand Fancy California Figs..........	"
27733	Seeman Bros., New York. White Rose Brand Smyrna Figs......	Basket
27732	Smyrna Fruit Co. Erbeyly Brand Pulled Figs..........	Box
27879	" " Erbeyly Brand Superior Quality Figs.........	Basket
27603	Van Dyk & Catrevas. Imperial Brand Washed Figs............	Box
27773	" " " "	"
27792	" " " "	Jar
27711	White Lily Sterilized Selected Pulled Figs, Packed in Turkey.....	Box
27919	R. C. Williams & Co., New York. The Famous Royal Scarlet Brand Fresh Figs..........	Jar
27983	R. C. Williams & Co., New York. Vizier Brand Smyrna Figs....	Basket

The cost ranged from 9 to 15 cents per package, weighing at time of purchase from 10.3 to 15 ozs., the cost per pound of fruit ranging from 10 to 16.8 cents.

Dates.

No chemical data were secured with the eight samples of dates. The cost ranged from 10 to 25 cents per package, weighing at

FIGS.

Price per package.	Net weight of Figs.	Polarization.			Sulphur dioxide per 100 gms.	Claims of Labels.
		Direct 22°	After Inversion 22°	After Inversion 87°		
cts.	oz.				mgms.	
10	5.5	— 7.16	— 8.36	2.78	0	Washed and conserved in corn syrup.
25	12.1	— 3.98	— 4.76	2.40	0	Prepared with corn syrup.
20	11.7	— 8.16	— 9.04	2.58	0	Prepared in corn syrup.
19	9.2	—11.88	—12.28	0.40	0	
18	9.5	— 9.90	—11.08	2.00	0	Prepared with sugar and corn syrup.
10	5.9	— 7.16	— 7.96	1.20	0	
10	5.6	—17.04	—17.40	1.44	0	Prepared with pure corn syrup.
25	14.7	—11.96	—11.56	0.60	0	Prepared with corn syrup.
35	18.5	+32.40	— 9.68	....	0	
30	14.3*	— 7.52	— 7.92	2.78	0	Prepared with corn syrup.
9	9.2	—18.30	—18.48	0.36	16.6	Bleached with sulphur.
25	9.9	—11.58	—12.40	1.40	0	Prepared with corn syrup.
10	5.8	—12.38	—12.76	1.00	0	Washed and conserved in corn syrup.
10	5.5	— 9.18	— 9.16	3.00	0	Conserved in corn syrup.
25	10.6	— 8.98	— 9.60	2.00	0	Prepared with corn syrup.
22	12.0	— 8.32	— 8.72	1.20	0	
10	4.9	— 4.00	— 4.20	2.20	0	
14	10.9	— 9.94	—10.32	1.40	0	
5	3.5	—18.34	—18.32	0.00	45.3	
30	13.2	—13.96	—13.92	0.00	0	Prepared with sugar and corn syrup.
25	14.6	—11.94	—12.76	0.60	0	" " " " " "
25	13.8†	— 7.98	— 8.76	2.00	0	" " " " " "
10	4.7	— 8.18	— 9.76	3.08	0	Prepared with corn syrup.
25	11.2	— 8.00	— 8.40	2.60	0	" " " "
15	9.7	— 8.76	— 9.96	1.80	0	" " " "
20	13.1	—12.36	—12.76	1.00	0	
35	13.0	— 4.80	— 6.00	0.80	0	Prepared with corn syrup.
23	13.0	—11.98	—11.60	1.40	0	Prepared with sugar and corn syrup.

* Claimed 1 lb. net weight. † Claimed 13.5 oz. net when packed.

TABLE VI.—RAISINS.

Station No.	Manufacturer and Brand.	Claimed Weight.	Net weight. At time of purchase.	Net weight. After days specified.	Days between weights.	Cost per package.	Cost per lb. of fruit based on 1st net weight.
			oz.	oz.		cts.	cts.
27798	American Vineyard Co., Fresno, Cal. The Ideal "Not-A-Seed" Raisins	......	15.4	15.0	75	12	12.5
27911	Antler Brand Fancy Seeded Raisins	......	16.0	15.2	70	12	12.0
27741	The J. K. Armsby Co., Fresno, Cal. Owl Brand Fancy Seeded Raisins	......	15.8	15.3	78	12	12.2
27604	Austin, Nichols & Co., New York. Violet Seeded Raisins	......	15.5	15.0	85	14	14.5
27668	Blue Seal Extra Fancy Seedless Raisins	......	10.6	9.2	83	9	13.6
27827	The F. C. Bushnell Co., New Haven. Butter-Nut Brand Fancy Seeded Raisins	......	15.4	14.7	74	13	13.5
27606	California Fruit Canners Asso., Fresno, Cal. Del Monte Brand Fancy Seeded Raisins	......	15.7	15.5	85	13	13.2
27998	Castle Bros., Cal. Castle Brand Selected Raisins	......	13.9	12.5	63	16	18.4
27664	Castle Bros., Cal. Castle Brand Fancy Thompson Seedless Raisins	......	15.4	14.6	83	10	10.4
27997	Clark, Chapin & Bushnell, New York. Diamond Brand Sultana Raisins	......	14.9	14.1	63	25	26.8
27886	Lewis De Groff & Son, New York. Health Brand Seeded Raisins	......	14.5	14.0	70	15	16.6
27646	El Cajon Raisin Co., El Cajon, Cal. Hibiscus Brand Fancy Seeded Raisins	1 lb. gross when packed	15.9	15.1	84	13	13.1
27828	Ellis Bros., Fresno, Cal. Dandy Brand Fancy Seeded Raisins	......	11.4	11.1	74	9	12.6
27709	Fresno Home Packing Co., Fresno, Cal. Blue Ribbon Fancy Seeded Raisins	......	16.3	15.7	82	13	12.8
27605	Gold Medal Brand Seeded Raisins, Finest Quality California Loose Muscatels	......	14.9	14.4	85	15	16.1
27618	Great Atl. & Pac. Tea Co., Jersey City, N. J. Grandmother's Brand A. & P. Seeded Raisins	......	15.9	15.5	85	10	10.1
27620	*Wm. A. Higgins & Co., New York. Golden Wedding Seedless Sultana Raisins	......	14.3	13.4	85	16	17.9
27778	The Hills Bros. Co., New York. Royal Excelsior Brand Seeded Raisins	......	13.7	13.2	76	13	15.2
27617	Kings Co. Raisin & Fruit Co. Red Bird Choice Seeded Raisins	......	15.3	15.0	85	10	10.5
27630	Francis H. Leggett & Co., New York. Premier Brand Seeded Raisins	......	15.3	14.5	85	13	13.6
27801	Madison & Bonner, Fresno, Cal. California Seal Brand Seeded Raisins	......	16.6	15.8	75	10	9.6
27675	Malaga Packing Co., Malaga, Cal. Floresca Brand Fancy Seeded Raisins	15-16 oz. gross when packed	15.5	15.1	83	12	12.4
27979	Malaga Packing Co., Malaga, Cal. Malpago Brand Thompson Seedless Raisins	......	15.5	14.9	67	12	12.4
27980	Meyer & Lange, New York. "Au Gourmet" Finest Cleaned Sultana Raisins	1 lb.	14.6	14.4	67	17	18.6
27627	North Ontario Packing Co., Cal. Glen Rosa Brand Fancy Seeded Raisins	......	16.0	15.7	85	11	11.0
27941	Seeman Bros., New York. White Rose California Seeded Muscatel Raisins	......	16.3	15.6	68	12	11.8
27882	Selma Fruit Co., Selma, Cal. Pheasant Brand Fancy Seeded Raisins	......	16.0	15.6	74	17	17.0
27912	Stoddard, Gilbert & Co., New Haven. Hermitage Brand Fancy Seeded Raisins	......	16.1	15.2	70	12	11.9
27978	The Twitchell-Champlin Co., Portland, Me. Hatchet Brand Seeded Raisins	......	14.7	14.5	67	12	13.1
27639	The Union Pacific Tea Co., New York. Sovereign Brand Fancy Seeded Raisins	......	14.2	13.8	84	11	12.4
27826	D. M. Welch & Son, New Haven. Fancy Seeded Raisins	......	15.7	15.1	74	11	11.2
27999	R. C. Williams & Co., New York. Robin Hood Brand Seeded Raisins	......	15.5	14.8	63	12	12.4

*17.3 mgms. SO_2 per 100 gms.

time of purchase from 9.2 to 16.1 ozs., the cost per pound of fruit ranging from 9.9 to 43.5 cents, an extremely wide variation.

Figs.

Twenty-eight samples were examined, nineteen of which were labeled as prepared with corn syrup and five as prepared with sugar as well. The polarizations showed wide variations, direct at 22° C. from —3.98 to —18.34; after inversion at 22° C. from —4.20 to —18.48; after inversion at 87° C. from ±0.00 to +3.08. Neither the amount of cane sugar or glucose used was large in any case, except in **27988** where the figs were packed in sugar syrup.

Two samples contained sulphur dioxide, No. **27805**, 16.6 mgms., and No. **27775**, 45.3 mgms. per 100 gms. of figs; in the latter sample the sulphur dioxide was not declared on the label.

The size and nature of the packages of figs varied so much that a comparison as to cost is hardly satisfactory.

Prunes.

The cost of the two samples was 15 and 17 cents per package, weighing 13.5 and 15.4 ozs., respectively, at time of purchase.

Raisins.

Thirty-two samples of raisins were examined. Only one sample contained sulphur dioxide, No. **27620**, a brand of Sultana raisins, containing 17.3 mgms. per 100 gms. of raisins; this was not declared on the label.

The cost ranged from 9 to 25 cents per package, weighing at time of purchase from 11.4 to 16.6 ozs., the cost per pound of fruit ranging from 9.6 to 26.8 cents.

GLUTEN AND SPECIAL FOODS.

Eleven samples of gluten foods and similar preparations were examined. While some of these were not specially recommended for use by diabetics, the chief use of a gluten preparation is to provide a food rich in nitrogenous compounds and as poor as possible in starch. Some of these samples are excellent from this standpoint, while others contain so much starch that their claims

TABLE VII.—GLUTEN FOODS AND SPECIAL PREPARATIONS.

Station No.	Brand.	Net weight of sample.	Cost per package.	Cost per lb.	Water.	Ether Extract.	Fiber.	Protein (N x 6.25).	Ash.	Nitrogen-free Extract.	Starch.
		oz.	cts.	cts.							
28012	Akoll Biscuit	4.0	22	80	9.25	26.88	0.38	53.19	3.88	6.42	1.53
28013	[1]Brusson Diabetic Bread	1.2	10	133	12.70	1.83	0.26	37.25	0.80	47.16	40.14
28007	Barker's Gluten Food. Herman Barker, Somerville, Mass.	12.8	125	156	7.42	0.52	0.23	86.88	0.35	4.60	0.00
28006	[2]Soy Bean Gruel Flour. Cereo Co., Tappan, N. Y.	12.4	50	65	4.92	20.49	1.90	45.69	4.44	[3]22.56	0.63
28003	20% Gluten Meal. The Kellogg Food Co., Battle Creek, Mich.	15.1	25	26	9.77	0.46	0.13	27.50	1.42	60.72	49.64
28004	40% Gluten. The Kellogg Food Co., Battle Creek, Mich.	11.3	50	71	9.72	0.89	0.16	47.00	1.38	40.85	31.86
28005	80% Gluten. The Kellogg Food Co., Battle Creek, Mich.	15.0	60	64	9.05	0.92	0.17	81.25	0.58	8.03	6.21
28008	Avena-Gluten Biscuit Mixture. The Kellogg Food Co., Battle Creek, Mich.	12.3	25	33	7.93	12.68	0.41	21.38	2.12	55.48	41.13
28010	40% Gluten Biscuit. The Kellogg Food Co., Battle Creek, Mich.	3.1	25	129	10.20	0.49	0.15	47.50	0.48	41.18	35.01
28009	80% Gluten Biscuit. The Kellogg Food Co., Battle Creek, Mich.	6.7	30	72	10.09	0.87	0.06	82.38	2.08	4.52	4.68
28011	Breakfast Toast. The Kellogg Food Co., Battle Creek, Mich.	9.0	13	23	7.70	1.92	0.26	13.63	1.60	74.89	57.42

[1] Claimed 35 per cent. protein. [2] Claimed 44 per cent. protein, 20 fat, 10 cane sugar and a trace of starch. [3] 9.11 per cent. cane sugar.

to be diabetic foods are unfounded if not fraudulent, and their use by diabetic patients attended with considerable danger.

Akoll Biscuit has high percentages of protein and fat, and a very low content of starch.

Brusson Diabetic Bread, while it exceeds its protein guaranty, cannot be recommended for use by diabetics because of its high starch content, over 40 per cent.

Barker's Gluten Food makes no specific claim on its label, yet it contains nearly 87 per cent. of protein, higher than any other sample examined, and no starch whatever.

Soy Bean Gruel Flour (Cereo Co.) contains a fairly high percentage of protein, high fat and only a trace of starch. It contains about 9 per cent. of cane sugar, doubtless added to increase its palatability.

20% Gluten Meal (Kellogg's) bears this statement on the label, "It is claimed for 20% Gluten that a large portion of the starch has been removed, and experience shows that it is better adapted to all but exceptional cases than is pure Gluten, besides being more palatable and less expensive." While it is true that modern medical practice in diabetes permits the use of food containing as much starch as the patient can normally assimilate, it would certainly be an "exceptional case" where a preparation containing nearly 50 per cent. of starch could be recommended for a sufferer from diabetes.

40% Gluten (Kellogg's) bears these statements: "Prepared by a process which almost wholly excludes all the elements with the exception of gluten," "This food is absolutely indispensable to persons suffering with Diabetes, a disease which is better controlled by its use than by any other known means." A preparation containing nearly 32 per cent. of starch cannot be said to have the starch "almost wholly" excluded. A food containing so much starch cannot be "absolutely indispensable" to diabetics, and that by the use of such a food diabetes is better controlled "than by any other known means" is of more than doubtful truthfulness. The following sample bears exactly the same claim, which obviously cannot be true for both of two such dissimilar products.

80% Gluten (Kellogg's) bears exactly the same claims as the *40% Gluten.* This preparation is a high-grade article, containing over 81 per cent. of protein and only a small amount of starch.

The above claim, relieved of some of its exaggeration, might fairly be applied to a food of this nature.

Arena-Gluten Biscuit Mixture (Kellogg's) claims to be made from oatmeal and wheat gluten "especially for the use of Diabetics." Once more we repeat that a material containing 41 per cent. of starch is not safe or desirable food to recommend generally for diabetics.

40% Gluten Biscuit (Kellogg's) claims "Good for Well Folks—Best for Diabetics—Well for All Folks." Containing as it does 35 per cent. of starch it certainly is not "best for diabetics."

80% Gluten Biscuit (Kellogg's) bears the same claim as the preceding sample and with much more justification. It contains over 82 per cent. of protein and less than 5 per cent. of starch.

Breakfast Toast (Kellogg's) claims to be "prepared from whole wheat bread made from hulled wheat flour dextrinized, partly predigested. Retains all the food value of wheat." How "hulled" wheat flour can make "whole" wheat bread is difficult to understand. The claim for partial predigestion probably rests on the assertion that the flour is dextrinized. It has been dextrinized only in small part, as over 57 per cent. of raw starch remains.

The preparation of foods containing much gluten and little starch is an expensive process and high prices must be charged for the resultant foods. But when a diabetic patient pays a high price for a food which is claimed to meet his particular needs, and analysis shows that the food is utterly unfitted for his requirements, he is defrauded and, depending on the manufacturer's claims, pays his good money for a food which may work actual harm upon him.

For convenience of reference the various analyses of diabetic and gluten preparations made at this station since 1906 are collected in Table VIIa. Sixty-four other analyses made by this station are given in the Report for 1906, page 156.

HONEY.

The official standard for honey is as follows:

"Honey is the nectar and saccharine exudations of plants gathered, modified and stored in the comb by honey bees (*Apis mellifica* and *A. dorsata*); is laevo-rotatory, contains not more than twenty-five (25)

TABLE VIIa.—ANALYSES OF DIABETIC PREPARATIONS.

(Supplemental to Table XVI, Rept. 1906, p. 156.)

Material.	Manufacturer.	Analysis of Material as purchased.						
		Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free extract.	Fat.	Starch.
Flour and Meal.								
Barker's Gluten Food	Herman Barker, Somerville, Mass.	7.42	0.35	86.88	0.23	4.60	0.52	0.00
Soy Bean Gruel Flour	Cereo Co., Tappan, N. Y.	4.92	4.44	45.69	1.90	22.56*	20.49	0.63
C. B. X. (Cold Blast Extra Flour) 25% Protein	The Health Food Co., New York	8.71	0.51	10.13	0.15	79.63	0.87	68.85
Dr. Johnson's Educator Standard Gluten Flour	Johnson Educator Food Co., Boston.	7.32	0.82	40.13	0.23	50.10	1.40	40.91
20% Gluten Meal	The Kellogg Food Co., Battle Creek, Mich.	9.77	1.42	27.50	0.13	60.72	0.46	49.64
40% Gluten	The Kellogg Food Co., Battle Creek, Mich.	9.72	1.38	47.00	0.16	40.85	0.89	31.86
80% Gluten	The Kellogg Food Co., Battle Creek, Mich.	9.05	0.58	81.25	0.17	8.03	0.92	6.21
Hoyt's Gum Gluten Flour	The Pure Gluten Food Co., New York	8.12	1.04	38.25	0.19	50.78	1.62	42.35
Gluten Flour (in bulk)	Sold by D. M. Welch & Son, New Haven	8.73	0.70	18.00	0.17	71.40	1.00	61.61
" "	Sold by D. M. Welch & Son, New Haven	....	....	16.25	....	....	....	....
"	R. O. Bischof, London, Eng.	10.08	1.26	79.75	0.15	5.21	3.55	....
Diabetic Flour	Unknown	....	....	38.00	....	....	....	....
" "	"	....	....	17.81	....	....	....	....
Bread, Biscuit, etc.								
Akoll Biscuit		9.25	3.88	53.19	0.38	6.42	26.88	1.53
Diabetic Gluten Bread	R. O. Bischof, London, Eng.	7.40	4.74	73.13	0.02	14.26	0.45	....
"Essentiel" Bread for Super Alimentation	" "	7.28	4.84	26.63	0.08	59.57	1.60	....
40% Gluten Biscuit	Battle Creek Sanitarium Food Co., Battle Creek, Mich.	8.04	1.63	43.25	0.17	45.71	1.20	35.28
Gluten Bread	Brusson Jeune, Villemur, France.	7.47	1.08	32.06	0.23	57.07	1.79	49.77

*9.11 per cent. sucrose.

TABLE VIIa.—ANALYSES OF DIABETIC PREPARATIONS.—*Continued.*

(Supplemental to Table XVI, Rept. 1906, p. 156.)

Material.	Manufacturer.	Analysis of Material as purchased.						
		Water	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free extract.	Fat.	Starch.
Bread, Biscuit, etc. (continued).								
Gluten Bread	Brusson Jeune, Villemur, France	12.70	0.80	37.25	0.26	47.16	1.83	40.14
Casoid Dinner Rolls	Callard, Stewart & Watt, London, Eng.	....	....	80.81	....	....	....	3.33
Casoid Biscuits, Plain, No. 2	" " " " "	....	....	58.12	....	....	....	0.00
Casoid Biscuits, Sweet, No. 3	" " " " "	....	....	54.69	....	....	....	0.54
No. 2 Proto Puffs	The Health Food Co., New York	8.15	1.79	52.38	0.22	35.98	1.48	27.18
Educator Gluten Cookies	Dr. Wm. L. Johnson	4.75	2.73	26.44	0.31	49.79	15.98	37.80
Avena-Gluten Biscuit Mixture	The Kellogg Food Co., Battle Creek, Mich.	7.93	2.12	21.38	0.41	55.48	12.68	41.13
40% Gluten Biscuit	The Kellogg Food Co., Battle Creek, Mich.	10.20	0.48	47.50	0.15	41.18	0.49	35.01
80% Gluten Biscuit	The Kellogg Food Co., Battle Creek, Mich.	10.09	2.08	82.38	0.06	4.52	0.87	4.68
Diabetic Bread	Unknown	29.60	1.45	21.24	45.11		2.60	33.66
Miscellaneous.								
Granola	Battle Creek Sanitarium Food Co., Battle Creek, Mich.	6.14	2.34	13.88	0.64	76.20	0.80	45.23
Pates aux Oeufs Macaroni	Brusson Jeune, Villemur, France	8.57	0.68	13.94	Tr.	76.38	0.43	69.21
Vermicelle au Gluten Extrait, etc.	" " "	7.96	0.80	18.44	Tr.	72.37	0.43	65.79
Pates aux Oeufs Nouillettes	" " "	8.67	0.65	14.38	Tr.	75.77	0.53	68.90
Gluten Semolina (Semoule du Gluten)	" " "	9.65	0.70	17.19	0.28	71.72	0.46	64.89
Sanitas Meltose	The Kellogg Food Co., Battle Creek, Mich.	26.81	0.46	0.63	....	72.10*	....	....
Hoyt's Gum Gluten Granules	The Pure Gluten Food Co., New York	7.48	1.46	45.50	0.31	43.70	1.55	32.27
Hoyt's Gum Gluten Breakfast Food	" " "	7.48	1.23	37.81	0.38	51.77	1.33	37.89
Hoyt's Gum Gluten Noodles	" " "	8.26	1.13	36.56	0.21	51.48	2.36	42.03
Hoyt's Gluten Macaroni	" " "	10.34	0.74	41.37	0.29	46.28	0.98	....
Spaghetti	The Marvelli Co., Harbor Beach, Mich.	....	....	15.50	....	....	....	....

* 47.09 per cent. maltose, 2.08 per cent. sucrose, 18.80 per cent. dextrin, 4.13 per cent. other carbohydrates.

per cent. of water, not more than twenty-five hundredths (0.25) per cent. of ash, and not more than eight (8) per cent. of sucrose."

"Chemically considered, the ideal honey is a concentrated solution of invert sugar (i. e. of the sugars dextrose and levulose in equal proportions), with traces of ash, formic acid, nitrogenous bodies, dextrin, and other organic substances not sugar. This ideal type of honey, unfortunately, is the exception, since the impurities so generally introduced by bees from plant juices, honeydew, and other sources affect the composition of honey to a very marked degree. A limit, even if it be an arbitrary one, must therefore be set for the percentage of such impurities, in order that a suitable standard may be maintained for the composition of honeys sold upon the market."*

The adulterants most commonly used at present in honey are cane sugar, commercial glucose and invert sugar. Cane sugar may either be introduced directly or by feeding it to the bees. Glucose in the past has been the most common adulterant of honey. It closely resembles honey in color and consistence, and its ability to prevent granulation even when used in very small quantities is a strong incentive to its use. Invert sugar has long been a favorite adulterant of honey, and as honey itself consists of nearly three-quarters invert sugar, its detection is rather difficult. The present examination was confined chiefly to the three adulterants just enumerated.

Twenty-six samples of bottled strained honey were analyzed. Nos. **27500, 27598, 27599, 27600, 27636, 27708, 27804, 27894, 27920** and **27967** showed more or less granulation. The color ranged from almost colorless to brown.

The methods of analysis used were essentially those employed by Browne (see reference above). To avoid the error due to birotation, the solutions were allowed to stand for twenty hours before making the direct polarization. In many of the samples crystallization had begun; these were carefully heated to 45° to 50° C. until complete solution was effected, and the samples then cooled to room temperature.

Direct polarization was made at 22° and 87° C., and the invert polarization at the same temperatures. Invert sugar was determined as total reducing sugars, using 10 gms. of honey, and 2 cc. of alumina cream making up to 50 cc. with water. After filtering, 10 cc. of the filtrate was made up to 200 cc. with water, and 20 cc. (= .2 gm. honey) used for the determination. Free acidity is reported as formic acid, although it is recognized that other acids may be present.

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* Browne: U. S. Dept. Agl. Bur. of Chem., Bull. *110*, p. 10.

TABLE VIII.—

Station No.	Manufacturer and Brand.
27599	[5]W. H. Archer, Port Chester, N. Y. Warranted Pure White Clover Honey
27598	[3]Austin, Nichols and Co., New York. Busy Bee Brand Pure Extracted Honey
27673	[2]Austin, Nichols and Co., New York. Sunbeam Pure Food Honey
27894	[4]A. C. Bristol, Meriden. Pure Honey
27600	[4]H. W. Coley, Westport. Warranted Pure Honey
27772	[3]Lewis DeGroff and Son, New York. Health Brand Pure Honey
27884	[4]W. H. Dickinson, Middletown. Extracted Honey Warranted Pure
27791	[3]Falcon Packing Co., New York. Falcon Brand Pure Honey
27986	[4]W. D. Foote, Westville. Pure Honey
27771	[6]C. S. Guernsey, Thomaston
27769	[4]C. P. Heinze, Woodbury
27968	[2]Hildreth and Segelken, New York. Pure California White Sage Honey
27808	[3]Humbert and Andrews, Brooklyn, N. Y. Acme Brand Pure Strained Honey
27942	[4]W. J. Lamb Co., W. Somerville, Mass. Pure Florida Honey
27708	[3]P. W. Latham and Co., Norwich. Guaranteed Pure Honey
27597	[1]Francis H. Leggett and Co., New York. Premier Pure Strained Honey
27601	[3]Jos. M. McCane and Son, New York. Orange Bloom Brand Pure Honey
27985	[3]Montclair Jam Kitchens, Montclair, N. J. Highest Grade Honey.
27500	[3]New England Maple Syrup Co., Boston. Golden Tree Pure Honey
27602	[3]Frank L. Park, White Plains, N. Y. Warranted Pure Honey
27734	[1]The Royal Cheese Co., Detroit, Mich. Royal B Absolutely Pure Honey
27967	[1]Simpson Spring Co., So. Easton, Mass. Gold Label Pure Honey
27804	[4]Simpson Spring Co., So. Easton, Mass. Victor Brand Pure Honey
27636	[2]Vermont Maple Syrup Co., New Haven. Pride of the Farm Brand Pure Honey
27920	[2]R. C. Williams and Co., New York. Famous Royal Scarlet Brand Pure Honey
27672	[2]R. C. Williams and Co., New York. Famous Royal Scarlet Brand Pure Honey
	Maximum
	Minimum
	Average

[1]Nearly colorless. [2]Pale straw color. [3]Deep straw color. [4]Yellow. [5]Yellow brown. [6]Brown.

Polarization. The direct polarization ranged from —2.4 to —27.5, average, —15.6, at 22° C., and from +1.5 to +20.0, average +9.2, at 87° C. The invert polarization ranged from —5.94 to —31.24, at 22° C., and from ±0.0 to +19.2, at 87° C. Browne has pointed out (see reference above)

HONEY.

Cost per bottle.	Net weight of contents.	Cost per lb. of Honey.	Polarization.					Invert Sugar.	Free Acidity as Formic.	Ash.
			Direct.		Invert.					
			22° C.	87° C.	22° C.	87° C.	Difference.			
cts.	oz.	cts.								
15	7.4	32.4	−16.6	+ 9.0	−19.58	+ 5.2	24.78	74.30	0.12	0.25
10	7.7	20.8	−15.3	+ 9.0	−19.47	+ 6.0	25.47	70.70	0.09	0.04
10	[7]4.9	32.7	−14.0	+ 8.4	−21.78	+ 6.8	28.58	66.60	0.06	0.06
25	14.8	27.0	−15.6	+ 8.0	−18.26	+ 8.0	26.26	72.15	0.14	0.17
25	14.6	27.4	−17.0	+ 6.6	−20.24	+ 6.0	26.24	74.75	0.17	0.11
25	12.9	31.0	−15.4	+ 8.2	−20.46	+ 6.6	27.06	66.80	0.12	0.24
35	22.3	25.1	− 9.3	+15.5	−13.64	+10.6	24.24	67.90	0.09	0.14
15	5.3	45.3	−17.2	+ 9.2	−20.35	+ 7.8	28.15	72.45	0.09	0.09
20	10.7	30.0	−23.3	+ 6.8	−25.96	+ 5.0	30.96	71.20	0.10	0.18
25	15.7	25.5	− 2.4	+19.6	− 6.27	+17.0	23.27	66.45	0.15	0.35
25	11.6	34.5	− 2.9	+20.0	− 5.94	+19.2	25.14	68.45	0.10	0.26
10	6.8	23.5	−21.4	+ 6.0	−23.32	+ 5.6	28.92	73.20	0.08	0.12
25	18.7	21.4	−15.4	+10.2	−21.12	+ 8.0	29.12	71.45	0.08	0.18
25	14.5	27.6	−24.7	+ 2.6	−27.50	+ 2.0	29.50	69.35	0.12	0.12
18	10.5	27.4	− 9.2	+14.3	−13.64	+10.4	24.04	72.20	0.09	0.23
10	[8]6.9	23.2	−17.0	+ 7.8	−25.08	+ 4.8	29.88	70.50	0.07	0.06
15	[9]7.2	33.3	−12.5	+10.8	−21.45	+ 5.0	26.45	65.45	0.13	0.10
25	17.0	23.5	−13.1	+11.4	−15.40	+ 8.0	23.40	73.20	0.07	0.36
10	6.7	23.9	−15.6	+ 7.6	−20.79	+ 5.8	26.59	76.53	0.08	0.04
25	14.7	27.2	−27.5	+ 1.5	−31.24	± 0.0	31.24	73.25	0.14	0.15
10	6.4	25.0	−20.1	+ 6.3	−25.08	+ 6.2	31.28	73.70	0.07	0.03
10	4.5	25.6	−17.6	+ 7.3	−23.32	+ 6.0	29.32	71.50	0.07	0.09
10	6.3	25.4	−18.2	+ 9.0	−19.80	+ 7.4	27.20	74.60	0.10	0.21
10	8.8	18.2	−20.0	+ 2.0	−23.32	+ 2.0	25.32	72.90	0.09	0.18
10	5.3	30.2	−14.0	+10.8	−20.24	+ 8.0	28.24	71.45	0.07	0.09
25	13.8	29.0	−11.3	+10.5	−22.88	+ 6.0	28.88	71.05	0.06	0.06
		45.3	−27.5	+20.0	−31.24	+19.2	31.28	76.53	0.17	0.36
		18.2	− 2.4	+ 1.5	− 5.94	± 0.0	23.27	65.45	0.06	0.03
		27.9	−15.6	+ 9.2	−20.24	+7.05	27.29	71.23	0.10	0.15

[7] Claimed net wgt., 4¼ oz. [8] Claimed net wgt., about 5⅔ oz.
[9] Claimed net wgt., about 8 oz.

that the difference between the invert polarizations at 20° and 87° C. is fairly constant for nearly all honeys, 95 per cent. of the samples he examined ranging from 23 to 30. The range of difference in our samples may be summarized as follows:—

No. of Samples.	Degrees Ventzke.
5	23-25
7	25-27
7	27-29
4	29-30
3	30-32

The range was from 23.27 to 31.28, average, 27.29, as compared with Browne's average of 26.71 for pure honey. There is nothing in these values, considered by themselves, to indicate any adulteration in our samples.

Calculation of sucrose in honey by the Clerget formula may introduce an error, in some cases exceeding one per cent. Such a calculation may be used, however, as a rough means of determining the presence of excessive sucrose. By this formula our samples showed from 1.22 to 8.80 per cent. sucrose, values which are probably too high in all cases. As the official standard permits as much as 8 per cent. of sucrose, all these samples may be considered as satisfying the standard in this respect.

Commercial Glucose. The A. O. A. C. method for estimating glucose in honey consists in polarizing the inverted solution at 87° C., multiplying this reading by 100 and dividing by 163. The fact that all honeys are more or less dextrorotatory at 87°, makes it necessary to use extreme caution in this method of calculating glucose.

Another method of calculation, much used in Europe, is based upon the variation in the invert polarization of the sample from the average polarization of pure honey. Using Browne's values for pure honey this formula would be $y = \frac{P + 17.5}{193}$, in which y = per cent. of commercial glucose and P = invert polarization Ventzke of normal weight of sample. This method, while giving somewhat better results than the A. O. A. C. method, makes no allowance for the wide range in the invert polarization of pure honeys (—29.26 to +14.96), thus making possible a considerable error.

Browne suggests still a third method of calculation based upon the lowering of the difference in invert polarization between 20° and 87° C.; this difference he found to average 26.7. The difference in invert polarization between 20° and 87° C. is multiplied by 77, the average percentage of invert sugar after inversion for pure honey, and this product is divided by the percentage of invert sugar after inversion found in the sample. This quotient multiplied by 100 and divided by 26.7, gives the percentage of pure honey in the sample.

All the samples were tested by these three methods of calculation. Only five samples were somewhat suspicious because of the rather high plus polarization at 87°. The figures were as follows:

No.	Per cent. of Glucose. A. O. A. C. Method.	European Method.	Browne Method.
27708	6.38	2.00	4.1
27769	11.78	5.99	0
27771	10.43	5.82	0
27884	6.54	2.00	0
27985	4.91	1.09	7.9

Owing to the existing uncertainty in all these methods of calculation the Beckmann test* was applied to these doubtful samples. The results were negative in each case.

Invert Sugar. The invert sugar ranged from 65.45 to 76.53, average, 71.23 per cent., all well within the limits for pure honey. It is possible that some of the lower percentages may be due to the presence of excessive water, but this point was not determined. All the samples were tested for added invert sugar by Ley's ammoniacal-silver test† and by the anilin-acetate test‡. In four cases the latter test gave slight indications of the presence of added invert sugar, but no absolutely positive results.

Free Acidity. The free acidity, calculated as formic, ranged from 0.06 to 0.17, average, 0.10 per cent., all well within the usual accepted limits.

Ash. The ash ranged from 0.03 to 0.36, average, 0.15 per cent., only two samples exceeding the standard's maximum, 0.25 per cent.

Summary.

While in a few cases certain tests indicate the presence of a small amount of glucose, and in two instances the percentage of ash exceeds the standard, we do not feel justified in condemning any sample as adulterated or otherwise illegal. There are wide variations in quality but all the samples appear to be genuine honeys of varying origins.

In three samples a definite net weight was claimed; in two of these the weight delivered considerably exceeded that claimed; in **27601**, however, there was a shortage of ten per cent. The cost per pound of honey ranged from 18.2 to 45.3 cents, with an average of 27.9 cents, depending to some degree on the size of the package, and probably, in certain cases, on the quality of the honey.

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* Zeit. anal. Chem., 1896, *35*, 267.
† Pharm. Zeit., 1902, *47*, 603.
‡ Bur. of Chem., Bull. *110*, 68.

RICE.

Partly in response to a popular demand for a perfectly white product, and partly to make a low-grade article appear of superior quality, the practice of "facing" or "polishing" rice has become very general. Formerly the polishing was effected by shaking the rice in a bag of sheepskin or other suitable material. Of late, however, the rice has been polished either by the use of paraffin oil or by talc in connection with a small amount of glucose. The word "talc" is used here in a broad sense. It is almost impossible to identify absolutely the mineral matter used, for french chalk, talc and steatite, substances whose use has been suggested, show relatively small differences in composition as regards their chief ingredients, silica, magnesia and iron and alumina.

The use of talc or similar polishing material is objectionable for several reasons. It is entirely unnecessary, for if polishing must be practiced there are other methods less objectionable. Moreover the demand for white rice is a whimsical fancy of the purchaser, to satisfy which a part of the nutriment of the rice is removed. The amount of foreign mineral matter present is sometimes sufficient to materially affect the weight, which is fraudulent. Furthermore the presence of even small quantities of insoluble mineral matter may be injurious to health because of the irritation it causes and because of the possible formation of fœcal concretions.

It is quite probable that nearly all the polished rice shipped in interstate commerce is so branded as to declare the presence of foreign mineral matter, but it is also true that the retail purchaser is seldom advised of the contamination, when he purchases rice in bulk. In the case of the forty-four samples purchased by us and the eighteen purchased by the Dairy Commissioner, the agent was not informed in a single instance that he was buying polished rice, although over half of the samples were certainly thus polished.

In the present examination only total ash and ash insoluble in hydrochloric acid were determined. Genuine unpolished rice should not contain over 0.30 to 0.40 per cent. of ash, and only a very small part of this should be insoluble in hydrochloric acid. The amount of acid-soluble ash is a fairly constant quantity in

TABLE IX.—RICE NOT FOUND ADULTERATED.

Station No.	Dealer.	Price per lb. cts.	Weight claimed. oz.	Weight found. oz.	Ash, Total.	Ash Insoluble in HCl.	Ash Soluble in HCl.	Appearance of Ash.
27796	*Bridgeport:* Village Store Co.	5	16	16.6	0.41	0.01	0.40	Fused.
27802	Logan Bros. Co.	5	16	16.4	0.50	0.04	0.46	"
27803	Bridgeport Public Market	8	16	16.0	0.35	0.02	0.33	"
27812	The Mohican Co.	8	16	15.9	0.32	0.03	0.29	"
27969	*Hartford:* Wise, Smith & Co.	7	16	16.2	0.45	0.04	0.41	"
27970	H. Griswold	10	16	16.0	0.42	0.06	0.36	"
27971	J. A. Pilgard	9	16	15.7	0.38	0.06	0.32	"
27972	City Hall Grocery	10	16	16.4	0.39	0.04	0.35	"
27977	†Tracy's Grocery	10	16	16.0	0.39	0.01	0.38	"
27900	*Meriden:* Boston Grocery	8	16	16.8	0.35	0.05	0.30	"
27901	N. P. Lamontagne	10	16	16.7	0.34	0.06	0.28	"
27902	Logan Bros. Co.	5	16	16.2	0.50	0.04	0.46	"
27694	*Norwich:* W. J. Townsend	5	16	16.2	0.38	0.04	0.34	"
27815	*New Haven:* D. M. Welch & Son	10	16	16.4	0.34	0.01	0.33	"
27817	M. C. Dingwall	5	16	16.0	0.33	0.02	0.31	"
27614	*South Norwalk:* Royal Grocery Co.	5*	8	9.1	0.41	0.05	0.36	Partly fused.
27615	Atlantic & Pacific Tea Co.	4*	8	8.2	0.35	0.03	0.32	Fused.
27932	*Waterbury:* The Mohican Co.	5	16	16.4	0.39	0.05	0.34	"
27933	Penn. Merchandise Co.	10	16	16.4	0.34	0.04	0.30	"
27934	Model Market Co	8	16	16.5	0.44	0.06	0.38	"
27936	Hewitt's Grocery	10	16	16.0	0.33	0.02	0.31	"

* Half pound. † "Natural Pure Food Head Rice, Uncoated," B. Fischer & Co., New York.

TABLE X.—RICE COATED WITH TALC.

Station No.	Dealer.	Price per lb. cts.	Weight. claimed. oz.	Weight found. oz.	Ash Total.	Ash, Insoluble in HCl.	Ash, Soluble in HCl.	Appearance of Ash.
27939	*Bristol:* L. G. Merick	10	16	16.0	0.44	0.10	0.34	Powdery.
27940	Foucault & Roberge	10	16	17.7	0.47	0.13	0.34	"
27643	*Danbury:* C. L. Morgan	8	16	16.0	0.52	0.18	0.34	"
27895	*Meriden:* McBride & Co.	10	16	16.0	0.53	0.08	0.45	Partly fused.
27888	*Middletown:* Village Store	8	16	16.0	0.47	0.16	0.31	Powdery.
27889	Atlantic & Pacific Tea Co.	5	16	16.6	0.38	0.08	0.30	"
27890	Middletown Cash Grocery	9	16	15.5	0.55	0.16	0.39	"
27955	*New Britain:* Sovereign Trading Co.	10	16	15.8	0.40	0.08	0.32	"
27956	Wray & Co.	5	16	16.0	0.55	0.14	0.41	"
27957	Miller & Olson	10	16	16.1	0.64	0.21	0.43	"
27958	*Great Western Market	7	16	15.1	0.47	0.03	0.44	Fused.
27813	*New Haven:* Johnson & Bro.	10	16	19.9	0.43	0.06	0.37	Powdery.
27816	E. Schoenberger & Sons	8	16	18.8	0.61	0.28	0.33	"
27830	Wm. Hellar	6	16	16.2	0.40	0.12	0.28	"
27669	*New London:* Mills Tea & Butter Co.	6	16	16.8	0.45	0.13	0.32	"
27695	*Norwich:* A. Francis & Son	10	16	15.7	0.56	0.15	0.41	"
27935	*Waterbury:* †Spencer Pierpont Co.	10	16	15.0	0.49	0.09	0.40	Partly fused.
27937	F. J. Fabricant	10	16	16.2	0.83	0.40	0.43	Powdery.

* Short weight, not adulterated. † Also short weight.

TABLE XI.—RICE SOLD AS COMPOUND.

27638	*Danbury:* *Union Pacific Tea Co.	5	16	15.8	0.30	0.03	0.27	Fused.
27647	†Village Store Co. (Pioneer Brand Choicest Head Rice.)	10	16	16.1	0.33	0.04	0.29	"
27814	*New Haven:* †S. S. Adams. (Adams' Brand Selected Fancy Head Rice.)	10	16	16.1	0.34	0.03	0.31	"
27686	*New London:* *Kiely's Tea Store. (Imperial Extra Fancy Domestic Rice, Japan Style, B. Fischer, N. Y.)	10	16	16.4	0.56	0.21	0.35	Powdery.
27938	*Waterbury:* *T. S. Cruess. (White Swan Brand Fancy Head Rice, The R. N. FitzGerald Co., Hartford)	10	16	16.1	0.39	0.06	0.33	Fused.

* On back, "Coated with $\frac{1}{1000}$ part glucose and $\frac{1}{5000}$ part talc. † On back, "Coated with glucose and talc.

both polished and unpolished rice. The appearance of the ash is also of value in judging as to the presence of talc. Unpolished rice gives a fused, glassy ash, while that of polished rice has a powdery appearance. A few of the samples passed by us as unpolished because of the fused appearance of the ash, contained suspiciously high percentages of total and insoluble ash.

Of the forty-four station samples, twenty-one were passed, seventeen contained talc or similar material, one was short-weight, and five were labeled as compound.

The samples not classed as adulterated ranged from 0.32 to 0.50 per cent. total ash, from 0.01 to 0.06 per cent. acid-insoluble ash, and from 0.28 to 0.46 per cent. acid-soluble ash. The samples found to contain talc ranged from 0.38 to 0.83 per cent. total ash, from 0.06 to 0.40 per cent. acid-insoluble ash, and from 0.30 to 0.44 per cent. acid-soluble ash. Only one of the five samples labeled as containing talc showed unmistakably that adulterant.

Samples **27958** and **27935**, sold respectively by Great Western Market, New Britain, and Spencer-Pierpont Co., Waterbury,

TABLE XII.—RICE.

(Sampled by Dairy Commissioner.)

Sample No.	Dealer.	Ash.			Appearance of Ash.
		Total.	Insoluble in Hcl.	Soluble in Hcl.	
	Passed.				
6326	*Bristol:* Foucault & Roberge	0.38	0.04	0.34	Fused.
6854	*Meriden:* McBride & Co.	0.36	0.05	0.31	"
6851	*Middletown:* Bielfield & Thayer	0.44	0.08	0.36	"
6853	Middletown Cash Grocery	0.37	0.03	0.34	"
6329	*New Britain:* Sovereign Trading Co.	0.39	0.02	0.37	"
6330	Great Western Market	0.33	0.05	0.28	Mostly fused.
6336	*New Haven:* Wm. Heller	0.44	0.05	0.39	Fused.
6338	E. Schoenberger& Sons	0.37	0.03	0.34	"
6333	*Norwich:* A. Francis & Son	0.30	0.02	0.28	"
	Coated with Talc.				
6327	*Bristol:* M. H. Smith	0.41	0.06	0.35	Powdery, slight fusion.
6332	*Danbury:* C. L. Morgan	0.72	0.29	0.43	Powdery.
6852	*Middletown:* Atlantic & Pacific Tea Co.	0.66	0.29	0.37	"
6328	*New Britain:* Wray & Co	1.03	0.55	0.48	"
6331	Miller & Olson	0.45	0.08	0.37	"
6339	*New Haven:* Johnson Bros.	0.37	0.06	0.31	Powdery and fused.
6334	*New London:* Mills Tea and Butter Co.	0.50	0.09	0.41	Mostly fused
6324	*Waterbury:* Spencer Pierpont Co.	0.57	0.14	0.43	Powdery.
6325	F. I. Fabricant	0.48	0.11	0.37	"

were decidedly short-weight, amounting to about one ounce in a pound.

The prices ranged from 5 to 10 cents per pound, the polished rice averaging about 0.5 cent higher per pound.

Entirely independent of the use of talc, the samples showed much variation in quality. Nos. **27796, 27802, 27969, 27900, 27902, 27694, 27932, 27934, 27643** and **27956** consisted very largely of broken or very small grains. Nos. **27815, 27940** and **27938** contained living insects.

Eighteen samples were taken by the Dairy Commissioner on our complaint. Nine of these were passed and nine were found to contain talc or similar material. The passed samples contained from 0.30 to 0.44 per cent. total ash, from 0.02 to 0.08 per cent. acid-insoluble ash, and from 0.28 to 0.39 per cent. of acid-soluble ash. The samples containing talc contained from 0.37 to 1.03 per cent. total ash, from 0.06 to 0.55 per cent. acid-insoluble ash and from 0.35 to 0.48 per cent. acid-soluble ash.

Nos. **6852, 6334** and **6328** consisted largely of broken grains, the latter also containing considerable dirt, which probably accounts in part for its abnormally high ash.

SAUSAGE.

In the analysis of samples of sausage for the dairy and food commissioner (see page 204), a useful method for the determination of starch was devised by Messrs. Bailey and Shepard, which consisted essentially of a combination of the well-known Mayrhofer and Sachsse methods. The following is a description of their experience with this method.

THE DETERMINATION OF STARCH IN MEAT PRODUCTS.

By E. M. Bailey and C. E. Shepard.

In the examination of meat and meat products for added starchy materials Mayrhofer's method is generally recommended for the determination of starch, and it is one of the provisional methods of the A. O. A. C. Upon applying this method in the course of an inspection of sausage, frankfurts, etc., we noticed that in Bur. of Chem., Bulletin 107 (revised), p. 110, l. 11, the sentence beginning "Acidify the filtrate . . ." is evidently intended to read "Acidify the solution . . ." After strongly acidifying the alkaline starch solution, making up to volume and filtering, an extremely slow filtration ensues and the filtrate is very turbid. This turbidity is independent of the starch content of the sample under examination and is probably due to protein substances not entirely removed by the previous treatment. An abstract of Mayrhofer's paper in *The Analyst, 22,* 11 (1897) recommends to make the alkaline solution up to volume, filter and precipitate starch in an aliquot portion previously acidified with acetic acid. By this procedure the filtration is somewhat improved and the filtrate is reasonably clear.

For a number of reasons, however, we found the method unsatisfactory. Chief among these are the slow filtration of the alkaline starch solution, already mentioned, the time-consuming operation of filtering and washing the precipitated starch, and the use of tared papers. We therefore determined to try a modification of the method by directly hydrolyzing the starchy residue after the removal of protein and fat by the first filtration, then determining dextrose by copper reduction. This procedure is open to the criticism that any cellulose in the starchy residue is subjected to partial hydrolysis, but this objection has not proved serious enough to invalidate the method for the purpose at hand.

The complete procedure is as follows:

Mayrhofer-Sachsse Method for Starch in Meat Products. Treat 20 grams of the sample in a casserole with 50 c.c. of 8 per cent. solution of potassium hydroxide and digest on a steam bath with frequent stirring until the meat is entirely dissolved. Maintain the original volume approximately by the addition of water in case the solution appreciably concentrates. Add an equal volume of 95 per cent. alcohol, stir thoroughly and filter on a small Buchner funnel provided with a thin asbestos mat. Should the filter clog and filtration become slow, transfer the mat with residue to the casserole removing any adhering residue in the funnel by means of a wisp of moist asbestos. Prepare a new filter. Add warm 4 per cent. potassium hydroxide in 50 per cent. alcohol to the residue in the casserole, disintegrate the mass by stirring and pour upon the new filter. Wash twice with warm 4 per cent. alcoholic potash and finally with 50 per cent. alcohol. (A new mat is not always necessary, but on the whole it wastes no time as the second filtration is always rapid. Moreover, the starch becomes incorporated with the asbestos and is better acted upon in the hydrolysis.) Remove the filter to a 500 c.c. flask, add 200 c.c. of water, 20 c.c. of hydrochloric acid,—specific gravity 1.125—and hydrolyze in a boiling water bath for two and a half hours. Nearly neutralize with dilute sodium hydroxide, cool and make up to 500 c.c. Determine dextrose in 25 c.c. of the filtrate (equivalent to 1 gram of material) using Allihn's copper solution. Multiply the weight of dextrose by 0.9 to obtain the weight of starch.

This combination of the Mayrhofer and Sachsse methods was tried in a number of cases by determining the starch content in one portion of a sample and again in a duplicate portion to which a weighed amount of anhydrous starch had been added. The sample was rendered as uniform as possible by hand mixing but this did not, in all cases, give as homogeneous a mixture as could be desired. The errors are somewhat increased by this factor.

The amounts of starch in the following table represent weights per gram of sample.

TABLE I.

	I.	II.	III.	IV.
Starch in sample, gm.	0.0010	0.0603	0.0019	0.0439
Starch added, gm.	0.0440	0.0440	0.0440	0.0440
Total starch present, gm.	0.0450	0.1043	0.0459	0.0879
Total starch found, gm.	0.0438	0.1073	0.0426	0.0836
Difference, in weight, gm.	—0.0012	+0.0030	—0.0033	—0.0043
" in per cent.	—0.12	+0.30	—0.33	—0.43

Taking into account the nature of the material worked upon, and remembering that the object of the determination is to distinguish between samples containing only spice starches and those containing added starchy materials, we believe that the results obtained are above reasonable criticism.

A comparison between the Mayrhofer method and the Mayrhofer-Sachsse method upon samples mixed as described is shown in the table below.

TABLE II.

Sample.	Mayrhofer Method.	Mayrhofer-Sachsse Method.	Difference by M.-S. Method.
6570	3.66%	3.96%	+0.30%
6571	4.68	4.86	+0.18
6573	1.09	1.24	+0.15
6574	0.50	0.31	—0.19
6575	3.18	2.73	—0.45
6577	0.30	0.20	—0.10
6578	2.25	2.02	—0.23
6580	2.09	2.13	+0.04
6581	0.38	0.40	+0.02

In addition to the determinations shown in Table II, 31 other determinations of starch in market samples were made, in duplicate, by the modified method. The percentages ranged from traces to 5.68 per cent. In only two cases was the variation between duplicates over 0.27 per cent., the average being 0.12 per cent. The method seems to meet all the requirements of a satisfactory working method at a saving in time of at least 50 per cent.

CANNED TOMATOES.

From the standpoint of output tomatoes are one of our most important canned vegetables. They naturally contain so much water in their tissues, that, unlike many other vegetables, such as corn and peas, it is unnecessary to add any water to them during the canning process. Such an addition is not only unnecessary, but has also been ruled as an adulteration by the U. S. government. (Food Inspection Decision 144.)

Tomatoes are filled into the cans either by hand or by machine. The cans filled full of whole tomatoes by hand are known as "hand-packed" or "solid packed," as distinguished from those filled by machine, or filled with a mixture of whole tomatoes and added juice. In machine-packed tomatoes the fruit is naturally more or less broken, thus affecting the appearance, but not the quality, of the product.

Tomatoes are sold under different grades, such as extra choice, extra select, choice, select, extra standard, standard and seconds. In many cases these prefixes are meaningless. The "extra choice" of one packer may be no better than the "standard" of another. The packer's name at the present time is more of a criterion as to quality than the grade specified. As Bitting says:*

> "There should be but two grades—selected or first grade, and standard or field run for the second. A can of first grade tomatoes should be from selected, prime, ripe fruit, having a fleshy body, well-developed flavor and uniform color. The can when opened should be full and most of the tomatoes whole or in large pieces, free from all peel, core, or defects. The net weight should not be less than 32 ounces in a No. 3 can. A can of standard tomatoes should be from sound, ripe fruit, having a fair body and good flavor. The can when opened should be full, and part of the tomatoes whole or in large pieces. They should be well peeled and cored. The net contents of a No. 3 can should not weigh less than 32 ounces."

Tomatoes are generally packed in No. 3 cans for household trade. This can may be of the regular size or what is known as "extra tall."

In judging canned tomatoes there must be considered the appearance, ripeness and quality of the fruit, the relative amounts of pulp and juice, and the amount, if any, of added water. Furthermore, it must be determined whether the original fruit consisted of sound material, or whether spoiled or partially spoiled stock had been used. Bacon and Dunbar have pointed out * that

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* Bur. of Chem., Bull. *151*, page 61.

> "When tomatoes spoil as a result of the life processes of bacteria, yeasts, and molds, the sugars are rapidly used up, being changed principally into acetic acid, lactic acid, alcohol and carbon dioxid, the amounts of these substances depending on the types of organisms which are most active in the particular sample in question. During most classes of spoilage the citric acid is also rapidly decomposed, so that its amount serves as a valuable index in detecting decomposition. It is very easy to detect spoilage in tomato pulp or canned tomatoes, as such products, when perfectly sound, contain no volatile acids and a considerable percentage of citric acid and invert sugar, and when spoiled quite large amounts of volatile acids are present with little or no invert sugar or citric acid."

Forty-one samples of canned tomatoes were examined, the brand names and packers of which are given in full in Table XIII.

TABLE XIII.—BRANDS.

27994. Whole Tomatoes. Oneida Community Limited, Oneida, N. Y.

27993. Highest Grade Tomatoes. Montclair Jam Kitchens, Montclair, N. J.

27954. Bay Ridge Brand Finest Quality Tomatoes. J. W. Bay & Co., Lincoln City, Del.

27926. Burt Olney's Solid Packed Selected Tomatoes. The Burt Olney Canning Co., Oneida, N. Y.

27991. Butter-Nut Brand Hand Packed Tomatoes Fancy Quality. Fredonia Preserving Co., New York.

27964. Golden Rose Brand Fancy Tomatoes. Seeman Bros., New York (Dist.).

27904. Golden Tip Brand Hand Packed Tomatoes Extra Selected. A. J. Tanner Co., Oakfield, N. Y.

27927. Locust Point Brand Hand Packed Tomatoes First Quality. Oriole Packing Co., Oriole, Md.

27897. Our Cook's Brand Tomatoes Fancy Quality. R. C. Williams & Co., New York (Dist.).

27891. Sunbeam Pure Food Hand Packed Tomatoes. Austin, Nichols & Co., New York (Dist.).

27892. Arlington Brand Selected Tomatoes. Austin, Nichols & Co., New York (Dist.).

27607. Orion Brand Red Ripe Tomatoes Selected Quality. Acker, Merrall & Condit Co., New York (Packed for).

27930. Oakland Brand Tomatoes Extra Quality. Granger & Co., Buffalo, N. Y. (Packed for).

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* Bur. of Chem., Circ. 78.

27690. Abbsco Brand Tomatoes First Quality. Jas. Wallace Packing Co., Cambridge, Md.

27899. Empire Tomatoes First Quality. Winters & Prophet Canning Co., Mount Morris, N. Y.

27691. Optimus Brand Tomatoes First Quality. Waddington & Holme, Naylors, Va.

27824. Our New Century Tomatoes First Quality. (Monogram) "B.R.P.C."

27963. Rosehill Brand Tomatoes First Quality. Charles Webster, East Newmarket, Md.

27992. Adieno Brand Tomatoes Choice Quality. Clark, Chapin & Bushnell, New York (Packed for).

27917. Whitby's Choice Tomatoes. C. H. Whitby & Son, Denton, Md.

27609. Bob White Brand Tomatoes, Standard Tomatoes. Albert Webb & Son, Vienna, Md.

27689. Ames' Quality Brand Tomatoes. S. K. Ames, Boston (Dist.).

27965. Antler Brand Tomatoes. Tucker & Goodwin, Hartford (Packed for).

27907. Bon Ton Brand Tomatoes. The R. N. Fitzgerald Co., Hartford (Packed for).

27645. Broad Creek Brand Tomatoes. E. C. Ross, Seaford, Del.

27950. Cirio's Peeled Tomatoes. Societá Generale delle Conserve Alimentari Cirio, S. Giovanni a Teduccio, Presso, Napoli, Italy.

27608. Glenmore Brand Tomatoes. The John Boyle Co., Baltimore, Md.

27928. Golden Rule Brand Tomatoes. Phillips Packing Co., Cambridge, Md.

27915. Guilford Tomatoes. Sachem's Head Canning Co., Guilford.

27794. Hazel Dell Brand Tomatoes. J. W. Bay & Co., Lincoln City, Del.

27797. Lake Erie Brand Tomatoes. Silver Creek Pressing Co., Silver Creek, N. Y.

27990. Maryland Special Brand Tomatoes. Phillips Packing Co., Cambridge, Md.

27807, 27953. M. and W. Brand Tomatoes. James T. Wilson & Co., Delmar, Del.

27678. Nabob Tomatoes. Francis H. Leggett & Co., New York (Dist.).

27962. Polo Brand Tomatoes. Stoddard, Gilbert & Co., New Haven (Packed for).

27823. Pride of Somerset Tomatoes. Arden Packing Co., Arden, Md.

27677. Red Bird Tomatoes. T. H. Chambers & Co., Federalsburg, Md.

27929. Richelieu Brand Tomatoes. Sprague, Warner & Co., Chicago (Dist.).

27989. St. Lawrence Brand Tomatoes. The Medina Canning Co., Medina, N. Y.

27946. Triangle Brand Tomatoes. Hoffecker Bros. & Hall, Smyrna Landing, Del.

Twenty-one samples claimed a special quality, ranging from "whole" to "standard." Two samples came in No. 2 cans, 27 in No. 3, 8 in No. 3, 5 in. Jersey, 1 in No. 3, 5.5 in. Jersey, 1 in an odd size (3½ x 3 11-16), and 2 in glass jars. The following is a summary of the net weight of contents in the various sized containers:—

No. of Samples.	Size of Can.	Net Weight of Contents. Max. gms.	Min. gms.	Ave. gms.
2	No. 2	584	579	582
27	No. 3	1003	879	940
8	No. 3, 5 in.	1056	987	1022
1	No. 3, 5.5 in.	—	—	1159
1	odd	—	—	497
2	jars	905	876	891

Accepting Bitting's figure of 32 ozs. (= 907 gms.) as a standard for No. 3 tomatoes, only one sample, **27927**, can be considered as short fill, containing 880 gms., or 31 ozs.

It is apparent, however, that net weight of contents considered by itself has little direct value, as this weight may be due to tomatoes, water, or a mixture of the two.

All the samples were separated, therefore, into pulp and juice, by straining through cheese cloth (40 threads to the inch) allowing the fruit to drain, without crushing, as long as the juice dropped freely. Such a method, of course, gives somewhat too high values for pulp and too low for juice. Too much importance may be given to the amount of pulp separated by this method. A high percentage of pulp may be secured by the use of hard, slightly green fruit. On the other hand a thoroughly ripe tomato, which alone has the full flavor of the fruit, may through its ripeness be more or less disintegrated during processing, or may be badly broken after a long shipment. The relative amounts of pulp and juice must, therefore, be considered with much care in order to reach a proper judgment. The Ohio Trade Standard for "fancy" tomatoes requires a minimum of 20 ozs. of fruit exclusive of juice, and for "standard" tomatoes a minimum of 18 ozs., both in No. 3 cans, containing about 32 ozs. net weight.

No. 3 is the standard size for tomatoes, and two-thirds of our samples are of that size. In these samples the pulp ranged from 264 to 541 gms., the juice from 408 to 682 gms., and the per cent.

of juice from 43 to 72. Eleven of the samples claimed superior quality, and none of these contained the minimum of 20 ozs. of fruit required by the Ohio Standard, ranging as they did from 11.7 to 15.5 ozs., and the percentage of juice from 54 to 64 per cent. Only three of the twenty-seven samples exceeded or approximated the minimum of 18 ozs. for "standard" tomatoes. Expressing these results in a different way, of the samples in No. 3 cans, 3 contained from 9.3 to 12 ozs. of drained pulp, 17 from 12.1 to 15 ozs., 4 from 15.1 to 18 ozs., and 2 from 18.1 to 19.1 ozs. Of the same samples 4 contained from 43 to 50 per cent. of juice, 15 from 52 to 60, 6 from 61 to 64 and 2 over 70.

Considering the samples as a whole, excluding **27891** and **27824** which were in No. 2 cans, and **27950**, an odd size, we find the drained pulp ranged from 264 to 698 gms., the juice from 405 to 682 gms., and the percentage of juice from 40 to 72 per cent. Only seven samples contained over 18 ozs. of fruit. It is apparent that the great majority of the brands examined contained excessive juice, and that the addition of water is a very common practice. The amount of added water will be considered later on in this report.

The character of the fruit showed considerable variation. In eight samples practically whole tomatoes were found; in twenty-five, large lumps, in four, small lumps, while in four a mushy consistency was observed. As regards ripeness, thirty-one samples were of excellent quality, while ten contained more or less wholly or slightly green pieces. Sample **27990** is quite striking from the fact that it contained a very high percentage of juice, 71 per cent., and only 9.5 ozs. of fruit, and that this small amount of fruit present was not ripe.

Excluding the two samples sold in glass and intended for fancy trade, and the three samples in odd sizes, the cost per can ranged from 9 to 15 cents. The cost per pound of dry matter ranged from 75 cents to $1.86, and the cost per pound of tomatoes of average water content from 4.8 cents to 11.9 cents. In the samples packed in glass the cost per pound of dry matter was $2.45 and $3.61. A study of the table shows that quality was not the sole consideration in determining cost, and that in many cases the consumer paid a high price for added water.

TABLE XIV.—

Station No.	Brand.	Quality claimed.	Weight of			
			Can and Contents.	Pulp and Juice.	Drained Pulp.	Juice.
			gms.	gms.	gms.	gms.
27994	Oneida Community...	Whole	1520	876	476	400
27993	Montclair Jam Kitchens................	Highest Grade.............	1514	905	407	498
27954	Bay Ridge...........	Finest Quality.............	1064	927	377	550
27926	Burt Olney	Solid Packed Selected......	1178	1023*	454	569
27991	Butter-nut............	Hand Packed Fancy Quality.	1220	1056	556	500
27964	Golden Rose.........	Fancy	1160	1003	430	573
27904	Golden Tip..	Hand Packed Extra Selected.	1163	1012	607	405
27927	Locust Point.........	Hand Packed First Quality.	1017	880	367	513
27897	Our Cook's..........	Fancy Quality..............	1087	936	380	556
27891	Sunbeam Pure Food..	Hand Packed...............	691	584	333	251
27892	Arlington............	Selected.	1177	1035	538	497
27607	Orion................	Red Ripe Selected..........	1067	927	332	595
27930	Oakland	Extra Quality.	1086	937	428	509
27690	Abbsco..............	First Quality...............	1049	911	353	558
27899	Empire	" "	1161	1008	483	525
27691	Optimus............	" "	1022	879	439	440
27824	Our New Century....	" "	680	579	296	283
27963	Rosehill	" "	1091	956	385	571
27992	Adieno..............	Choice Quality............	1087	943	349	594
27917	Whitby's	Choice	1093	952	409	543
27609	Bob White..........	Standard..................	1095	946	264	682
27689	Ames' Quality.......	....	1102	961	500	461
27965	Antler...............	....	1103	958	368	590
27907	Bon Ton.............	....	1080	941	408	533
27645	Broad Creek.........	....	1028	894	372	522
27950	Cirio's..............	Peeled.....................	606	497	227	270
27608	Glenmore............	....	1078	945	457	488
27928	Golden Rule.........	....	1045	911	389	522
27915	Guilford.............	....	1212	1055	562	493
27794	Hazel Dell..........	....	1079	941	411	530
27797	Lake Erie...........	....	1081	949	541	408
27990	Maryland Special.....	....	1061	924	270	654
27807	M. and W...........	....	1122	988	384	604
27953	"	....	1096	957	350	607
27678	Nabob	....	1321	1159	698	461
27962	Polo................	....	1055	921	385	536
27823	Pride of Somerset....	....	1098	960	412	548
27677	Red Bird............	....	1097	960	423	537
27929	Richelieu	....	1122	971†	530	441
27989	St. Lawrence.........	....	1155	987*	417	570
27946	Triangle	....	1161	998	367	631

*Claimed net wgt., 33 oz. = 936 gms. †Claimed net wgt. 34 oz. = 964 gms.

CANNED TOMATOES.

Per cent. Juice.	Nature of Tomatoes.	Ripeness.	Cost per Can.	Cost per lb.	
				of Dry Matter.	of Average Tomatoes.
			cts.	cts.	cts.
46	Whole.	O. K.	30	245	15·7
55	Some whole; large pieces.	"	35	361	23·1
59	Lumps.	Some green pieces.	13	139	8·9
56	Lumps.	O. K.	15	88	5·6
47	Some whole; large pieces.	"	15	91	5·8
57	Lumps.	"	13	120	7·7
40	Whole.	"	12	97	6·2
58	Lumps.	"	12	127	8·1
60	"	"	15	121	7·7
43	Some whole; large pieces.	"	10	158	10·1
48	Large lumps.	1 nearly green; rest O.K.	13	110	7·0
64	Lumps.	O. K.	10	108	6·9
54	"	Partly green.	10	75	4·8
61	"	Few green pieces.	10	139	8·9
52	"	Slightly green.	15	108	6·9
50	"	O. K.	10	89	5·7
49	"	"	8	120	7·7
60	Large lumps.	Slightly green.	10	106	6·8
63	One whole; large pieces.	O. K.	15	186	11·9
57	Small lumps.	"	9	78	5·0
72	Lumps.	"	10	156	10·0
48	"	Few green pieces.	10	99	6·3
62	Small lumps.	O. K.	12	108	6·9
56	Lumps.	"	10	107	6·8
58	"	"	12	176	11·3
54	Mushy.	"	12	174	11·1
52	Large lumps.	"	12	149	9·5
57	Lumps.	"	10	132	8·5
47	Some whole, large pieces.	"	13	120	7·7
56	Mushy.	"	10	79	5·1
43	Lumps.	"	11	108	6·9
71	Mushy.	Slightly green.	12	186	11·9
62	Lumps.	O. K.	9	90	5·8
63	Large lumps.	"	9	96	6·1
40	Small lumps.	Very ripe.	15	112	7·2
58	Lumps.	O. K.	13	152	9·7
59	"	Some green pieces.	12	124	7·9
56	Small lumps.	Very ripe.	13	140	9·0
45	Some whole; large pieces.	O. K.	15	127	8·1
58	Lumps; mushy.	One green.	12	69	4·4
63	Lumps.	O. K.	10	73	4·7

TABLE XV.—

Station No.	Brand.	Water.	Solids.	Salt-free Ash.	Salt (NaCl).	Sugar, as Invert.
27994	Oneida Community	93.66	6.34	0.444	0.249	3.38
27993	Montclair Jam Kitchens	95.12	4.88	0.422	0.550	1.45
27954	Bay Ridge	95.42	4.58	0.340	0.045	1.98
27926	Burt Olney	92.43	7.57	0.432	0.482	3.94
27991	Butter-Nut	92.94	7.06	0.390	0.630	3.09
27964	Golden Rose	95.11	4.89	0.400	0.186	2.14
27904	Golden Tip	94.46	5.54	0.348	0.121	2.62
27927	Locust Point	95.11	4.89	0.418	0.060	2.14
27897	Our Cook's	93.98	6.02	0.484	0.434	2.61
27891	Sunbeam Pure Food	95.09	4.91	0.374	0.236	2.23
27892	Arlington	94.80	5.20	0.483	0.065	2.45
27607	Orion	95.48	4.52	0.401	0.055	2.03
27930	Oakland	93.55	6.45	0.441	0.479	2.62
27690	Abbsco	96.42	3.58	0.277	0.051	1.41
27899	Empire	93.77	6.23	0.490	0.889	2.19
27691	Optimus	94.08	5.92	0.442	0.055	3.40
27824	Our New Century	94.79	5.21	0.519	0.077	2.41
27963	Rosehill	95.51	4.49	0.391	0.048	1.60
27992	Adieno	96.13	3.87	0.424	0.058	1.15
27917	Whitby's	94.53	5.47	0.463	0.057	2.52
27609	Bob White	96.98	3.02	0.270	0.033	1.24
27689	Ames' Quality	95.26	4.74	0.394	0.057	1.78
27965	Antler	94.75	5.25	0.524	0.040	2.15
27907	Bon Ton	95.49	4.51	0.389	0.052	1.68
27645	Broad Creek	96.56	3.44	0.347	0.059	1.39
27950	Cirio's	93.71	6.29	0.496	0.060	2.90
27608	Glenmore	96.14	3.86	0.333	0.036	1.79
27928	Golden Rule	96.22	3.78	0.280	0.039	2.04
27915	Guilford	95.36	4.64	0.343	0.196	2.03
27794	Hazel Dell	93.87	6.13	0.393	0.047	3.61
27797	Lake Erie	95.12	4.88	0.435	0.056	2.38
27990	Maryland Special	96.83	3.17	0.312	0.144	1.02
27807	M. and W	95.40	4.60	0.443	0.069	2.02
27953	M. and W	95.58	4.42	0.358	0.055	1.93
27678	Nabob	94.74	5.26	0.437	0.038	2.66
27962	Polo	95.78	4.22	0.449	0.051	1.74
27823	Pride of Somerset	95.40	4.60	0.520	0.056	2.14
27677	Red Bird	95.63	4.37	0 386	0.046	1.89
27929	Richelieu	94.48	5.52	0.486	0.038	2.25
27989	St. Lawrence	92.02	7.98	0.368	1.136	3.96
27946	Triangle	93.76	6.24	0.416	0.087	2.78
	Maximum	*96.98*	*7.98*	*0.524*	*1.136*	*3.96*
	Minimum	*92.02*	*3.02*	*0.270*	*0.033*	*1.02*
	Average	*94.91*	*5.09*	*0.409*	*0.176*	*2.26*

CANNED TOMATOES.

Sugar-free Solids.	Ammonia by Magnesium Oxide.	Acidity in cc. $\frac{N}{10}$ Na OH per 100 gms.		Citric Acid (Anhydrous).		Specific gravity of juice at 25° C.	In Dry Matter.				Per cent. Sugar in Salt-free Solids.
		Total.	Volatile.	Determined.	Calculated from total acidity.		Salt-free Ash.	Salt (NaCl).	Sugar, as Invert.	Citric Acid (Anhydrous.)	
2.96	0.011	52.0	2.4	0.46	0.36	1.0195	7.00	3.93	53.31	7.26	55.5
3.43	0.018	45.2	2.0	0.37	0.32	1.0140	8.65	11.27	29.71	7.58	33.5
2.60	0.022	44.8	1.6	0.31	0.31	1.0130	7.42	0.98	43.23	6.77	43.7
3.63	0.024	72.0	2.4	0.56	0.50	1.0270	5.71	6.37	52.05	7.40	55.6
3.97	0.026	44.0	2.8	0.28	0.31	1.0215	5.52	8.92	43.77	3.97	48.1
2.75	0.020	47.8	2.8	0.36	0.33	1.0160	8.18	3.80	43.76	7.36	45.5
2.92	0.021	54.0	2.6	0.39	0.38	1.0207	6.28	2.18	47.44	7.04	48.3
2.75	0.024	52.8	2.0	0.42	0.37	1.0160	8.55	1.23	43.76	8.59	44.3
3.41	0.014	50.0	1.6	0.37	0.35	1.0238	8.04	7.21	43.36	6.15	46,7
2.68	0.025	47.2	1.4	0.27	0.33	1.0198	7.62	4.81	45.42	5.50	47.8
2.75	0.019	60.4	1.0	0.43	0.42	1.0207	9.28	1.25	47.12	8.26	47.8
2.49	0.022	63.0	1.4	0.42	0.44	1.0122	8.87	1.22	44.91	9.29	45.5
3.83	0.022	66.8	1.6	0.59	0.47	1.0200	6.84	7.43	40.62	9.15	44.0
2.17	0.022	46.4	1.8	0.32	0.32	1.0126	7.74	1.42	39.39	8.94	40.0
4.04	0.014	53.6	1.6	0.46	0.38	1.0252	7.87	14.27	35.15	7.38	41.0
2.52	0.016	56.8	2.0	0.40	0.40	1.0224	7.47	0.93	57.43	6.76	58.0
2.80	0.016	49.2	2.2	0.41	0.34	1.0206	9.96	1.48	46.26	7.87	47.0
2.89	0.027	55.2	4.0	0.41	0.39	1.0130	8.71	1.07	35.63	9.13	36.0
2.72	0.024	53.8	2.6	0.44	0.38	1.0110	10.96	1.50	29.72	11.37	30.2
2.95	0.024	60.6	2.4	0.50	0.42	1.0220	8.46	1.04	46.07	9.14	48.1
1.78	0.012	37.8	3.0	0.22	0.26	1.0103	8.94	1.09	41.06	7.28	41.5
2.96	0.021	47.8	2.2	0.33	0.33	1.0160	8.31	1.20	37.55	6.96	38.0
3.10	0.021	51.6	2.4	0.42	0.36	1.0165	10.00	0.76	40.95	8.00	41.3
2.83	0.025	71.0	3.6	0.44	0.50	1.0170	8.63	1.15	37.25	10.00	37.7
2.05	0.019	46.8	2.8	0.29	0.33	1.0130	10.09	1.71	40.41	8.43	41.1
3.39	0.009	54.0	1.8	0.47	0.38	1.0170	7.89	0.95	46.10	7.47	46.6
2.07	0.010	43.8	2.6	0.30	0.31	1.0138	8.63	0.93	46.37	7.78	46.9
1.74	0.013	27.6	2.0	0.20	0.19	1.0120	7.41	1.03	53.97	5.29	54.5
2.61	0.020	64.0	3.2	0.52	0.45	1.0190	7.39	4.22	43.75	11.21	45.7
2.52	0.018	48.6	2.8	0.29	0.34	1.0226	6.41	0.77	58.89	4.73	59.4
2.50	0.018	55.2	5.0	0.43	0.39	1.0187	8.91	1.15	48.77	8.81	49.4
2.15	0.021	38.0	1.6	0.30	0.27	1.0100	9.84	4.54	32.18	9.46	33.7
2.58	0.024	65.2	3.0	0.44	0.46	1.0190	9.63	1.50	43.91	9.57	44.6
2.49	0.021	56.8	1.8	0.45	0.40	1.0175	8.10	1.24	43.67	10.18	44.3
2.60	0.012	47.6	2.8	0.41	0.33	1.0188	8.31	0.72	50.57	7.79	51.0
2.48	0.022	57.4	4.8	0.42	0.40	1.0150	10.64	1.14	41.23	9.95	41.8
2.46	0.018	58.8	2.0	0.40	0.41	1.0183	11.30	1.22	46.52	8.70	47.1
2.48	0.022	53.4	2.8	0.33	0.37	1.0166	8.83	1.05	43.25	7.55	43.8
3.27	0.027	68.0	2.0	0.53	0.48	1.0170	8.80	0.69	40.76	9.60	41.1
4.02	0.028	53.6	2.0	0.39	0.38	1.0290	4.61	14.24	49.62	4.89	57.9
3.46	0.017	54.0	2.4	0.35	0.38	1.0170	6.67	1.39	44.55	5.61	45.2
4.04	*0.028*	*72.0*	*5.0*	*0.59*	*0.50*	*1.0290*	*11.30*	*14.27*	*58.89*	*11.37*	*59.4*
1.74	*0.009*	*27.6*	*1.0*	*0.20*	*0.19*	*1.0100*	*4.61*	*0.72*	*29.71*	*3.97*	*30.2*
2.83	*0.020*	*53.1*	*2.4*	*0.40*	*0.37*	*1.0177*	*8.26*	*2.73*	*43.90*	*7.91*	*45.4*

Chemical Composition.

The average composition of 66 samples of tomatoes as given in Experiment Station Work, 1903, and the average composition of canned tomatoes as given by Wiley, Foods and their Adulteration, 1907, p. 315, are as follows:—

	Whole Tomatoes.	Canned Tomatoes.
Water	93.64	93.59
Fat	0.43	0.23
Fiber	0.75	0.60
Starch and Sugar	3.80	3.47
Sugar	3.05	—
Protein (N × 6.25)	0.91	1.29
Ash (NaCl free)	0.47	0.52
Salt	—	0.14
Citric Acid	0.48	—

The important determinations in judging the quality of canned tomatoes are solids, salt-free ash, sugar, citric acid, ammonia, volatile acid and specific gravity of the juice.

Solids. The solids ranged from 3.02 to 7.98, average, 5.09 per cent.; 7 samples contained under 4 per cent., 16 from 4 to 5, 8 from 5 to 6, and 10 over 6 per cent. Any sample containing less than 5 per cent. of solids must be suspected of containing added water; 23, or over half, of the samples fall under this suspicion.

Sugar. Invert sugar ranged from 1.02 to 3.96, average, 2.26 per cent. A deficiency in sugar might arise from under-ripe fruit, from added water or from spoilage. Other data failed to indicate spoilage in any of the samples, so we may dismiss that cause from consideration at this time. While in a few instances slightly green or under-ripe fruit was associated with a relatively low sugar content, unripeness in no case appeared to be the determining cause for the deficiency in sugar. It would seem, therefore, that chiefly added water influenced the sugar content. Fourteen samples contained from 1 to 2 per cent., 21 from 2 to 3 per cent., and only 6 over 3 per cent. The amounts of sugar contained in tomatoes of different varieties and of varying degrees of ripeness are far from constant. A consideration of the sugar-free solids, therefore, affords a better basis to work on.

Sugar-free Solids. The sugar-free solids ranged from 1.74 to 4.04, average, 2.83 per cent. Eleven samples contained from 1.7 to 2.4 per cent., 19 from 2.5 to 3, and 11 over 3 per cent. Less than 3 per cent. of sugar-free solids justifies a suspicion as to added water.

Salt-free Ash. The salt-free ash ranged from 0.270 to 0.524, average, 0.409 per cent. Twelve samples contained from 0.27 to 0.37, 21 from 0.38 to 0.47, and 8 over 0.47 per cent. Less than 0.40 per cent. would indicate added water, and less than 0.50 per cent. excite a strong suspicion as to its presence.

Salt. The salt ranged from 0.033 to 1.136, average, 0.176 per cent. Twenty-nine samples contained under 0.14 per cent., 8 from 0.14 to 0.50, and 4 over 0.50 per cent. In the last four samples the salt made up from 57 to 75 per cent. of the ash, seemingly an excessive quantity.

Citric Acid. Citric acid was determined directly in all the samples, and also calculated from the total acidity as determined by tenth-normal alkali. The determined values averaged 0.03 per cent. higher than the calculated. Citric acid ranged from 0.20 to 0.59, average, 0.40 per cent. Twelve samples contained less than 0.35 per cent., 6 from 0.35 to 0.40, 18 from 0.40 to 0.50, and 5 over 0.50 per cent. A low percentage of citric acid might be due to spoilage or to added water, but as already stated no evidence of spoilage was detected. Less than 0.35 per cent. of citric acid renders a strong suspicion of added water.

Volatile Acid. Volatile acid, as acetic, ranged from 0.006 to 0.030, the latter figure alone suggesting any marked amount of spoilage. In this sample the citric acid was nearly normal and the sugar only slightly below standard. There was, therefore, no evidence of any marked acetic acid fermentation in the samples.

Ammonia. The percentages of ammonia found tend also to the same conclusion. They ranged from 0.009 to 0.028 per cent., in no case significant.

Specific Gravity of Juice. This ranged from 1.0100 to 1.0290, average, 1.0177. While this determination is influenced to an important degree by added salt and by sugar which may have been natural to the fruit or directly added, it is significant that the seven samples with the lowest percentages of solids showed juice specific gravities ranging from 1.0100 to 1.0138, only one other sample showing as low as 1.0122, and only two as low as 1.0130.

Per Cent. of Sugar in Salt-free Solids. It was hoped that this determination might give some added data as to the ripeness of the tomatoes, but the variations in sugar content due to varietal differences, climatic influences, and the possible addition of sugars during the canning process, render their use of uncertain value. These percentages ranged from 30.2 to 59.4, average, 45.4.

Added Water. From our knowledge of the composition of the tomato fruit and of the process of canning tomatoes, we regard any sample as suspicious which contains less than 5 per cent. of solids, less than 3 per cent. of sugar-free solids, less than 0.35 per cent. of citric acid, and less than 0.5 per cent. of salt-free ash. Any sample containing less than 3 per cent. of sugar-free solids, less than 0.35 per cent. of citric acid or less than 0.4 per cent. of salt-free ash, we would condemn as containing added water. Based on these limits our samples may be grouped into three classes, 15 which we pass as genuine, 17 which we consider as suspicious, and 9 whose chemical composition indicates added water. The tabulation below shows the maximum, minimum and average figures obtained in each of these classes.

	Solids.	Sugar-free Solids.	Citric Acid.	Salt-free Ash.
Passed.				
Maximum	7.98	4.04	0.59	0.52
Minimum	4.88	2.75	0.28	0.42
Average	6.11	3.40	0.44	0.46
Suspicious.				
Maximum	6.13	2.96	0.52	0.52
Minimum	4.22	2.46	0.29	0.34
Average	4.90	2.66	0.33	0.40
Condemned.				
Maximum	4.37	2.72	0.45	0.42
Minimum	3.02	1.74	0.20	0.27
Average	3.72	2.18	0.32	0.33

The nine samples condemned as containing added water were Nos. **27608, 27609, 27645, 27677, 27690, 27928, 27953, 27990** and **27992.** None of these is condemned for shortage in one ingredient only. These certainly contain added water, and it is reasonably certain that some of those included in the suspicious class also contain added water, but from the data at hand we do not feel justified in condemning them. Six of these were packed in Maryland and two in Delaware.

NET WEIGHT OF VARIOUS PACKAGE GOODS.

In Bulletin 172 of this station were published the results of an investigation of the variations in net weight of certain classes of foods sold in package form. Brand names were not given in the bulletin, but they are published now for the guidance of the consumer. The detailed discussion of the bulletin will not be repeated here, attention being called only to those brands which showed a tendency towards short weight.

About 2,000 packages were weighed, representing 150 brands of about 75 kinds of foods.

A definite weight was claimed on 594 of the packages examined. Five hundred and seventeen of these either exceeded the claimed weight or were deficient by less than 0.25 oz. Of the 77 deficient samples the deficiency in 20 samples appeared to be exceptional, 102 samples of the same brands fully satisfying their claims. The remaining 57 samples, however, showed a general tendency towards short weight.

SAMPLES SHOWING SHORT WEIGHT.

The following brands showed the greatest deficiencies:

Potted Meat Beef Ham Flavor, Libby, McNeill & Libby. Halves. All 12 samples were deficient by from 1.0 to 1.4 ozs.

Medium Egg Macaroni, Freihofer. Ten of 12 samples were deficient by from 0.7 to 2.6 ozs.

Egg Elbow Macaroni, Freihofer. Eleven of 12 samples were deficient by from 0.4 to 1.3 ozs.

Egg Elbow Spaghetti, Gold Leaf, Freihofer. Eight of 12 samples were deficient by from 0.4 to 1.4 ozs.

Educator Toasterettes, Johnson. Ten of 12 samples were deficient by from 0.3 to 1.2 ozs.

Frotana, Nat. Biscuit Co. Four of 12 samples were deficient by from 0.3 to 0.8 oz.

Kellogg's Toasted Corn Flakes. Six of 12 samples were deficient by from 0.4 to 1.8 ozs.

RELATIVE AMOUNTS OF SOLIDS AND LIQUOR IN CANNED GOODS.

A statement of net weight may be misleading if quality is not considered as well. The addition of water to canned vegetables, fruits or fish might bring the net weight up to a normal figure, which would give but little information, however, as to the relative amount of food present. To illustrate this point duplicate samples of thirty brands of foods were separated into solid and liquid portions by draining through a sieve. The results were discussed in detail in Bulletin 172, and will not be repeated here. Attention is called, however, to the foot notes to Table XVI, in which these data are given in connection with the specific brands. Additional data will be found in our Report for 1910, page 462, and under tomatoes in this report.

THE COST OF PACKAGE GOODS.

Table XVI shows the cost per package and the cost per pound of the different foods. All these prices, with the exception of those for crackers and biscuit, represent prices based on dozen lots and probably were the most favorable prices obtainable by the purchaser in New Haven in April of this year. Granting that quality should have an important effect on price, these prices reveal, or rather emphasize, some important facts. For instance, Standard String Beans and Compass Brand String Beans both cost 7.5 cents per can of about equal capacity; the former, however, contained 58 per cent. of liquor compared with 50 per cent. in the latter. This comparison is even more striking when we consider the Magnes Refugee Beans which cost two cents more per can and yet contain only 38 per cent. of liquor. Similarly with tomatoes, the Butter-Nut Hand Packed cost 9.5 cents per No. 2 can, or 7.8 cents per pound of canned tomatoes, while the Maryland Special cost 11 cents per No. 3 can, or 5.6 per pound. While at first glance the latter brand seems the cheaper purchase, our analysis shows it to contain 71 per cent. of juice, while the Butter-Nut contains only 47 per cent. In the smaller can of the Butter-Nut, therefore, the purchaser would obtain 10.3 ozs. of drained tomatoes for two cents a can less than he would obtain in the larger can of Maryland Special, containing only 9.5 ozs. of drained tomatoes.

Again, the Jumbo Pie Peaches contained 32.4 ozs. of fruit and liquor per can, at a cost of 10.5 cents, while the Yellow Free Peaches contained 30.5 ozs. at 19 cents. These data apparently favor the Jumbo as much the cheaper purchase. When we con-

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Vegetables.						
Asparagus.						
Del Monte Brand Colossal Green. Cal. Fruit Canners Asso., San Francisco	24	32.2	30.7	[1]31.6	23	11.6
Del Monte Brand Green Tips. Cal. Fruit Canners Asso., San Francisco	24	16.8	16.0	[2]16.4	20	19.5
Artichokes.						
Libertas Brand. Fratelli Mustica, Palermo, Italy	12	24.4	22.3	[3]23.6	12	8.1
Beans.						
Magnes Red Kidney. Fredonia Pres. Co., Fredonia, N. Y.	24	22.0	20.7	[4]21.3	8	6.0
Magnes Ripe Lima. Fredonia Pres. Co., Fredonia, N. Y.	24	21.6	20.7	[5]21.3	9.5	7.0
Standard String. Gibbs Pres. Co., Baltimore, Md.	24	19.3	18.6	[6]19.0	7.5	6.3
Compass Brand String. D. E. Foote and Co., Baltimore, Md.	12	20.0	18.5	[7]19.4	7.5	6.2
Butter-Nut Fancy Refugee. Fredonia Pres. Co., Fredonia, N. Y.	24	20.8	19.9	[8]20.3	13.5	10.6
Magnes Refugee. Fredonia Pres. Co., Fredonia, N. Y.	24	20.8	20.5	[9]20.7	9.5	7.2
Magnes Yellow Wax. Fredonia Pres. Co., Fredonia, N. Y.	24	21.0	20.5	[10]20.8	8	6.1
Butter-Nut Golden Wax. Fredonia Pres. Co., Fredonia, N. Y.	24	20.8	20.6	[11]20.7	12	9.3
Beans and Pork.						
Van Camp's with Tomato Sauce. Van Camp Pack. Co., Indianapolis	18	22.5	21.8	[12]22.1	8	5.8
Snider's with Tomato Sauce, T. A. Snider Pres. Co., Cincinnati	12	22.8	22.0	[12]22.4	12	8.6
Beets.						
Butter-Nut Cherry. Fredonia Pres. Co., Fredonia, N. Y.	24	21.6	20.3	[13]21.2	10	7.5
Corn.						
Magnes Sweet. Fredonia Pres. Co., Fredonia, N. Y.	24	21.8	21.1	21.4	8	6.0
Northern Queen Sweet Sugar. F. C. Bushnell Co., New Haven	24	20.9	20.6	20.8	7.5	5.8
Butter-Nut Maine Fancy. Fredonia Pres. Co., Fredonia, N. Y.	24	20.9	20.4	20.7	10.5	8.1

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[1] 20.9 oz. solid, 10.7 oz. liquid. [2] 12.1 oz. solid, 4.3 oz. liquid. [3] 12.6 oz. solid, 11.0 oz. liquid. [4] 15.9 oz. solid, 5.4 oz. liquid. [5] 15.2 oz. solid, 6.1 oz. liquid. [6] 8 oz. solid, 11 oz. liquid. [7] 9.7 oz. solid, 9.7 oz. liquid. [8] 12.2 oz. solid, 8.1 oz. liquid. [9] 12.9 oz. solid, 7.8 oz. liquid. [10] 12.2 oz. solid, 8.6 oz. liquid. [11] 11.6 oz. solid, 9.1 oz. liquid. [12] Net wgt. 22 oz., claimed. [13] 16.3 oz. solid, 4.9 oz. liquid.

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.—*Continued.*

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Mushrooms.						
La Diane Selected. Von Bremen, Asche and Co., New York	12	15.7	15.0	[14]15.4	23	23.9
La Diane Pieces and Stems. Von Bremen, Asche and Co., New York	12	15.2	14.6	[15]14.9	16	17.2
Peas.						
Magnes Sweet Wrinkled. Fredonia Pres. Co., Fredonia, N. Y.	24	21.9	21.5	[16]21.7	10.5	7.7
Butter-Nut Little Gem Sifted. Fredonia Pres. Co., Fredonia, N. Y.	24	21.1	21.0	[17]21.0	12.5	9.5
New Process Green Split. The Cleveland Seed Co., Avon, N. Y.	12	16.4	15.9	16.0	10.5	10.5
Red Peppers.						
Pimientos Morrones. Fabr. Espec. de Cons. Veg., Calahorra, Spain	18	17.4	14.4	[18]16.6	13	12.5
Pimientos Morrones. Fabr. Espec. de Cons. Veg., Calahorra, Spain	12	8.4	7.6	[19] 8.0	8	16.0
Pumpkin.						
Golden Solid Dry Packed. U. H. Dudley and Co., New York	12	37.9	37.5	[20]37.6	10	4.3
Magnes Golden. Fredonia Pres. Co., Fredonia, N. Y.	12	33.2	33.1	33.2	9.5	4.3
Spinach.						
Butter-Nut Spring. Fredonia Pres. Co., Fredonia, N. Y.	12	34.0	32.9	33.4	12	5.7
Succotash.						
Butter-Nut Green Lima. Fredonia Pres. Co., Fredonia, N. Y.	24	21.3	19.3	20.8	11.5	8.8
Magnes. Fredonia Pres. Co., Fredonia, N. Y.	23	21.6	19.6	20.8	9.5	7.3
Tomatoes.						
Butter-nut Hand Packed. Fredonia Pres. Co., Fredonia, N. Y.	24	21.0	17.8	19.5	9.5	7.8
Half Moon Hand Packed. The Wm. H. Geer Co., New York	12	36.4	33.2	34.6	12.5	5.8
Maryland Special. Phillips Packing Co., Cambridge, Md.	12	33.2	32.3	[21]32.7	11.5	5.6
Red Fox Solid. The Wm. H. Geer Co., New York	12	33.7	31.1	32.6	12.5	6.2
Cirio Peeled. Soc. Gen. delle Cons. Alim. Cirio, S. Giovanni, Italy	12	18.3	15.9	17.5	8	7.3

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[14] 7.4 oz. solid, 8.0 oz. liquid; claimed net wgt., 15 oz. [15] 6.8 oz. solid, 8.1 oz. liquid. [16] 13.9 oz. solid, 7.8 oz. liquid. [17] 13.4 oz. solid, 7.6 oz. liquid. [18] Claimed net wgt., 15.5 oz. [19] Claimed net wgt., 7 oz. [20] Hand-stamped indistinctly "3% corn starch." [21] Excessive liquor small pieces, fruit not fully ripe.

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.—*Continued.*

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Fruits.						
Cherries.						
Royal Am. Golden Gate Packing Co., San Jose, Cal.	12	32.2	30.8	[22]31.4	23	11.7
Booth's Preserved White, Oval. A. Booth and Co., Baltimore, Md	24	21.4	19.8	[23]20.7	12.5	9.6
Rosebud, Colored and Flavored. Rheinstrom Bros., Cincinnati	8	31.6	31.0	[24]31.3	55	28.1
Peaches.						
Jumbo Pie. Miller Bros. and Co., Baltimore, Md...	12	33.1	31.3	[25]32.4	10.5	5.2
Yellow Free. Golden Gate Packing Co., San Jose, Cal.	12	31.3	29.7	[26]30.5	19	10.0
Sliced Lemon Cling. Golden Gate Packing Co., San Jose, Cal	12	31.4	30.3	[27]31.0	20	10.3
Pears.						
Triacan Extra Bartlett. The Wm. H. Geer Co., New York	24	21.3	19.4	[28]21.0	12.5	9.5
Bartlett. Golden Gate Packing Co., San Jose, Cal...	12	31.5	30.1	[29]30.5	21	11.0
Pineapple.						
Royal Hawaiian Sliced. Haiku Fruit and Pack. Co., Haiku, H. I	24	23.6	21.8	[30]22.9	21	14.7
Plums.						
Triacan Extra Lombard. The Wm. H. Geer Co., New York	24	21.3	20.9	[31]21.1	8	6.1
Fish.						
Underwood's Clams. Wm. Underwood Co., Boston.	12	16.4	15.6	[32]16.2	10	9.9
Pleasant River Maine Clams. H. S. Kane, Brooklin, Me	12	16.3	14.9	[33]16.1	8	8.0
Izumi Crab. S. Izumi, Hokkaido, Japan	12	16.4	16.2	16.4	30	29.3
Fish Flakes, Cod and Haddock. Burnham and Morrill Co., Portland, Me	12	10.1	7.2	8.5	7.5	14.1
Herrings in Tomato Sauce. Marshall and Co., Aberdeen, Scot	12	18.8	17.6	18.3	14	12.2
Kippered Herrings. Marshall and Co., Aberdeen, Scot.	12	17.1	16.2	16.6	14	13.5
Hume's Karluk Red Salmon. Alaska Packers Asso., San Francisco	12	17.5	16.9	17.3	17	15.6
Butter-Nut Columbia River Spring Salmon. F. C. Bushnell Co., New Haven	12	15.9	14.4	15.3	21	22.0
Butter-Nut Columbia River Spring Salmon. F. C. Bushnell Co., New Haven	12	8.1	7.6	7.9	12.5	25.3
Creole Barataria Shrimp. Pelican Lake Oyst. and Pack. Co., Houma, La	12	10.9	10.3	[34]10.7	10	14.9

[22] 18.9 oz. solid, 12.5 oz. liquid. [23] 11.8 oz. solid, 8.9 oz. liquid. [24] 20.1 oz. solid, 11.2 oz. liquid. [25] 16.9 oz. solid, 15.5 oz. liquid; skins not removed. [26] 19.5 oz. solid, 11.0 oz. liquid; claimed net wgt., 30 oz. [27] 20.5 oz. solid, 10.5 oz. liquid; claimed net wgt., 30 oz. [28] 12.3 oz. solid, 8.7 oz. liquid. [29] 20.4 oz. solid, 10.1 oz. liquid; claimed net wgt., 30 oz. [30] 16.7 oz. solid, 6.2 oz. liquid. [31] 11.8 oz. solid, 9.3 oz. liquid. [32] 6.4 oz. solid, 9.8 oz. liquid. [33] 5.6 oz. solid, 10.5 oz. liquid. [34] 4.8 oz. solid, 5.9 oz. liquid.

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.—*Continued.*

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Meats.						
Beech-Nut Sliced Bacon. Beech-Nut Pack. Co., Canajoharie, N. Y.	12	10.1	8.9	[35] 9.7	25	41.2
Beech-Nut Sliced Beef. Beech-Nut Pack. Co., Canajoharie, N. Y.	12	8.8	8.0	[36] 8.3	25	48.2
Corned Beef. Libby, McNeill and Libby, Chicago	12	12.3	11.7	[37] 12.1	16	21.2
" " " " " " "	12	24.8	23.4	24.2	27.5	18.2
Boned Chicken. Richardson and Robbins, Dover, Del.	12	14.1	12.8	13.6	46	54.0
Potted Meat Beef Ham Flavor. Libby, McNeill and Libby, Chicago	18	3.9	3.6	[38] 3.8	4	16.9
Potted Meat Beef Ham Flavor. Libby, McNeill and Libby, Chicago	12	5.5	5.1	[39] 5.4	8	23.7
Cooked Lunch Tongues. Libby, McNeill and Libby, Chicago	12	13.2	11.9	12.6	27.5	34.9
Soups.						
Mock Turtle. Franco-American Food Co., Jersey City, N. J.	12	17.7	16.9	17.3	17	15.7
Tomato Puree. Franco-American Food Co., Jersey City, N. J.	12	8.6	8.2	8.5	7.5	14.1
Tomato. Jos. Campbell Co., Camden, N. J.	18	11.9	11.3	[40] 11.5	7.5	10.4
Preserves.						
Beech-Nut Peanut Butter. Beech-Nut Pack. Co., Canajoharie, N. Y.	12	7.2	6.7	[41] 7.1	12	27.0
Compound Pineapple. Logan, Johnson and Co., Boston	4	14.3	13.2	13.7	8	9.3
Plum and Apple. Logan, Johnson and Co., Boston	4	13.9	13.3	13.7	8	9.3
Raspberry and Apple. Logan, Johnson and Co., Boston	8	13.7	13.2	13.4	8	9.6
Strawberry and Apple. Logan, Johnson and Co., Boston	8	14.0	12.7	13.3	8	9.6
Union Preserved Strawberries. Platt and Co., Baltimore, Md.	12	11.7	11.4	[42] 11.5	8	11.1
Apple Jelly Currant Flavor	12	9.9	9.6	9.8	15	24.5
Syrups, Molasses, Honey.						
Mt. Washington Maple Sap Syrup. Bay State Maple Syrup Co., Boston	12	19.4	17.5	18.5	20	17.3
Nutmeg Fancy Cane and Maple. Miner, Read and Tullock, New Haven	12	10.3	9.8	10.0	7.5	12.0
Karo. Corn Products Refining Co., New York	12	32.2	31.9	[43] 32.0	8	4.0
Aunt Dinah N. O. Molasses. Renick and Ford, New Orleans, La.	12	31.3	29.9	30.4	7.5	3.9
Compound Honey. Chas. Israel and Bros., New York	6	7.8	7.0	7.4	8	17.3

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[35] Claimed net wgt., 9 oz.

[36] Claimed net wgt., 8 oz.

[37] Claimed net wgt., 12 oz.

[38] Claimed wgt., 3.5 oz.

[39] Claimed wgt., 6.5 oz.

[40] Claimed wgt., 10.5 oz.

[41] Claimed wgt., 7 oz.

[42] 4.4 oz. solid, 7.1 oz. liquid.

[43] Claimed net wgt., 2 lbs.

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.—*Continued.*

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Pickles and Relishes.						
Oyster Cocktail Sauce. T. A. Snider Pres. Co., Cincinnati	12	9.8	9.5	[44] 9.7	12	19.8
Blue Label Tomato Ketchup. Curtice Bros. Co., Rochester, N. Y.	12	17.4	17.0	17.3	18	16.6
Ten Penny Chow Chow Pickles. The Williams Bros. Co., Detroit	11	8.8	8.4	8.6	8	14.9
Chili Sauce. The Williams Bros. Co., Detroit	12	9.3	8.3	8.8	8	14.5
Ten Penny Sweet Gherkin Pickles. The Williams Bros. Co., Detroit	12	9.1	8.1	8.7	8	14.7
Ten Penny Sweet Fancy Mixed Pickles. The Williams Bros. Co.. Detroit	12	8.1	7.6	7.9	8	16.2
Sweet Relish Pickles. The Williams Bros. Co., Detroit	12	10.8	10.4	10.7	8	12.0
Salad Dressing. E. R. Durkee and Co., New York	12	3.6	3.5	[45] 3.6	8	35.6
Condensed Milk.						
Magnolia Brand. Borden Cond. Milk Co., New York	12	14.9	14.7	[46] 14.8	10	10.8
Van Camp's Evaporated. Van Camp Packing Co., Indianapolis	12	6.0	6.0	[47] 6.0	4	10.7
Van Camp's Evaporated. Van Camp Packing Co., Indianapolis	12	17.1	16.7	[48] 16.9	8	7.6
Square Brand Skimmed. Hires Cond. Milk Co., Philadelphia	12	12.4	12.3	12.4	7.5	9.7
Pastes.						
Butter-Nut Alimentary Paste, Mezzani. F. C. Bushnell Co., New Haven	12	16.8	15.6	[49] 16.2	11	10.9
Medium Egg Macaroni. Freihofer Vienna Baking Co., Philadelphia	12	16.3	13.4	[49] 15.1	10	10.6
Egg Elbow Macaroni. Freihofer Vienna Baking Co., Philadelphia	12	15.9	14.7	[49] 15.6	10	10.3
Anger's Golden Seal Macaroni	12	6.7	5.5	6.1	7.5	20.0
Flag Brand Fine Egg Noodles. C. F. Mueller Co., Jersey City, N. J.	12	7.8	7.2	7.5	8	17.1
Gold Leaf Egg Noodles Medium. Freihofer Vienna Bak. Co., Phila.	12	8.5	7.9	8.2	10	19.5
Gold Leaf Egg Elbow Spaghetti. Freihofer Vienna Bak. Co., Phila.	12	16.0	14.6	[49] 15.4	10	10.4
Spaghetti Italian Style. Van Camp Packing Co., Indianapolis	36	21.9	21.0	21.5	12	8.9
Sphinx Superior White Vermicelli. Miner, Read and Tullock, New Haven	12	14.8	14.3	14.5	7	7.7

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[44] Claimed net wgt., 8 oz. [46] Claimed net wgt., 14.5 oz. [48] Claimed net wgt., 16 oz.
[45] Claimed net wgt., 3.25 oz. [47] Claimed net wgt., 6 oz. [49] Claimed wgt., 1 lb.

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.—*Continued.*

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Crackers and Biscuits.						
80% Gluten Biscuit. The Kellogg Food Co., Battle Creek, Mich.	4	7.0	6.2	6.7	30	72
40% Gluten Biscuit. The Kellogg Food Co., Battle Creek, Mich.	9	3.5	2.7	3.1	25	129
Breakfast Toast. The Kellogg Food Co., Battle Creek, Mich.	6	9.2	8.7	9.0	13	23
Educator Toasterettes. Johnson Educator Food Co., Boston	12	12.4	10.8	[50] 11.4	25	35
Educator Animal Crackers. Johnson Educator Food Co., Boston	5	14.8	13.9	[51] 14.4	25	28
Fruited Educator. Johnson Educator Food Co., Boston	5	11.0	10.7	10.8	25	37
Japanese Friendship Wafers. Banta and Van Buskirk, New York	10	4.1	3.2	3.5	25	114
Bostonia Sugar Wafers. O. B. Gilman, Boston	7	3.7	3.2	3.4	10	48
Sugar Wafers, Chocolate. Huntley and Palmer, Reading, Eng.	12	5.3	4.6	4.9	38	124
Republic Chocolate Wafers. G. J. R. Wafer Bakery, Freeville, N. Y.	12	14.3	12.5	13.3	45	54
Festino Almonds. National Biscuit Co., New York	6	5.2	4.8	[52] 5.1	25	78
Chocolate Tokens. " " " " "	12	6.5	5.4	[47] 6.0	25	67
Champagne Wafers. " " " " "	12	6.0	4.6	[53] 5.3	25	76
Nabisco Chocolate. " " " " "	12	3.6	2.6	[54] 3.0	10	53
Nabisco Vanilla. " " " " "	8	6.7	6.0	[55] 6.5	25	62
Social Tea Biscuit. " " " " "	9	6.7	6.3	[55] 6.6	10	24
Frotana. " " " " "	12	8.8	7.7	[56] 8.4	10	19
Saltine Biscuit. " " " " "	10	6.1	5.3	[57] 5.6	10	29
" " " " " " "	6	11.5	9.8	10.7	15	22
Five O'Clock Tea Biscuit. National Biscuit Co., New York	6	6.5	6.2	[55] 6.3	10	26
Baronet Biscuit. National Biscuit Co., New York	6	15.1	14.1	[50] 14.5	25	28
Fig Newtons. " " " " "	8	10.0	8.1	[56] 8.9	10	18
Uneeda Lunch Biscuit. National Biscuit Co., New York	8	5.1	4.4	[52] 4.8	5	17
Hydrox Chocolate Biscuits. Loose-Wiles Biscuit Co., Boston	4	8.3	7.8	8.1	30	59
Sunshine Brandywine. Loose-Wiles Biscuit Co., Boston	8	5.9	4.7	5.4	25	74
Sunshine Veronique. Loose-Wiles Biscuit Co., Boston	12	2.2	1.9	2.1	10	76
Sunshine Tan-San. " " " " "	8	3.0	2.3	2.6	15	92
Sunshine Butter Thin. " " " " "	1	....	....	7.1	10	23

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[50] Claimed net wgt., 12 oz.
[51] Claimed net wgt., 14 oz.
[52] Claimed net wgt., 4.5 oz.
[47] Claimed net wgt., 6 oz.
[53] Claimed net wgt., 5 oz.
[54] Claimed net wgt., 2.75 oz.
[55] Claimed net wgt., 6.25 oz.
[56] Claimed net wgt., 8.5 oz.
[57] Claimed net wgt., 5.25 oz.

TABLE XVI.—NET WEIGHT OF VARIOUS PACKAGE GOODS.—*Concluded.*

Brand and Manufacturer.	No. Packages weighed.	Net Weight.			Cost per package.	Average cost per lb.
		Maximum.	Minimum.	Average.		
		oz.	oz.	oz.	cts.	cts.
Cereals.						
Kellogg's Toasted Corn Flakes. Kellogg T. C. F. Co., Battle Creek	12	11.1	8.7	[40]10.1	8	12.7
Quaker Toasted Corn Flakes. Quaker Oats Co., Chicago	12	9.5	9.0	9.2	8	13.9
Quaker Rolled White Oats. Quaker Oats Co., Chicago	12	22.8	22.0	[58]22.5	8.5	6.0
Bufceco Rolled Oats. Buffalo Cereal Co., Buffalo, N. Y.	12	23.9	23.4	24.1	8.5	5.6
Hecker's Cream Farina. Hecker-Jones-Jewell Mill. Co., New York	12	32.7	32.3	32.4	12.5	6.2
Grandma's Pancake Flour Comp. Hecker-Jones-Jewell Mill. Co., New York	12	32.1	31.8	31.9	8.5	4.3
Reliable Self-Raising Prep. Flour. Reliable Flour Co., Boston	12	23.9	23.7	[59]23.8	10	6.7
Miscellaneous.						
Royal Baking Powder. Royal Baking Powder Co., New York	12	8.4	7.9	[60] 8.0	20	40.0
Royal Baking Powder. Royal Baking Powder Co., New York	12	4.0	3.8	[61] 4.0	11	44.0
Dunham's Orig. Shred Cocoanut. Dunham Mfg. Co., Brooklyn, N. Y.	12	4.7	3.6	[61] 4.0	7	28.0
Dunham's Orig. Shred Cocoanut. Dunham Mfg. Co., Brooklyn, N. Y.	12	9.8	7.9	[60] 8.7	13.5	24.8
None Such Mince Meat. Merrell-Soule Co., Syracuse, N. Y.	12	11.0	10.9	[62]10.9	8.5	12.5
Crisco. The Procter and Gamble Co., Cincinnati	12	24.2	24.1	24.1	20	13.3
Jello Ice Cream Powder. Genesee Pure Food Co., Le Roy, N. Y.	12	5.0	4.8	4.9	7.5	24.5
Tryphosa. E. C. Rich, New York	12	7.4	6.6	[19] 7.2	8	17.8
Dried Fruits.						
Butter-Nut Fancy Evap. Apples. F. C. Bushnell Co., New Haven	12	14.7	14.0	14.3	12.5	14.0
Serv-us Brand Cleaned Currants. Serv-us Pure Food Co., New York	12	14.9	13.9	14.6	11	12.1
Monogram Brand Dates. William Hills, Jr., New York	12	13.9	12.2	12.9	7.5	9.3
Very Best Prunes Gold Medal Brand. Santa Clara Co., Cal	12	13.0	11.9	12.4	10	12.7
Butter-Nut Fancy Seeded Raisins. F. C. Bushnell Co., New Haven	12	15.2	14.9	15.1	10	10.6

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[40] Claimed wgt., 10.5 oz.

[58] Claimed net wgt., 22 oz.

[59] Claimed net wgt., 1.5 lbs.

[60] Claimed net wgt., 8 oz.

[61] Claimed net wgt., 4 oz.

[62] Claimed net wgt., 10 oz.

[19] Claimed net wgt., 7 oz.

sider, however, that the peaches of this brand were unskinned and that the can contained 48 per cent. of juice against only 36 per cent. in the other, the apparent relative cheapness of this brand to a great extent disappears. Similar comparisons could be made with many other brands, but we cannot consider the whole table in detail.

The prices show another very important point, namely, the expensiveness of certain classes of canned products. Perhaps the consumer does not realize, when purchasing the thin-sliced bacon or smoked beef of undoubted delicious quality, he is paying 41 cents per pound for the former and 48 cents for the latter. In Potted Meat Beef Ham Flavor, formerly generally understood by the consumer to be "Potted Ham," but now revealed in its true light, he pays 17 or 24 cents per pound, depending on the size of the package, rather a high price for beef of inferior quality. Macaroni or noodles at 20 cents per pound is certainly not an economical purchase. The prices paid for crackers, especially in the smaller packages, are notably high. Cleanliness in manufacture and subsequent handling, of course, are important, but do they justify such prices as 92 cents, $1.14 or $1.24 per pound, to mention only a few of our most costly brands? Plain crackers, like Saltines, costing 29 cents per pound are hardly an economical food. Certain cereals like cornflakes are sold in what appear to be very generous packages, but the flakes in them cost 12.7 to 13.9 cents per pound.

Further details will not be cited, but we believe a careful study of Table XVI will give much useful data that have an important bearing on the "high cost of living."'

II. DRUG PRODUCTS.

ACETIC ACID.

(*Acidum Aceticum.*)

The Pharmacopœia defines acetic acid as "a liquid composed of not less than 36 per cent. by weight of absolute acetic acid, and about 64 per cent. of water, and obtained by the oxidation of ethyl alcohol or by the destructive distillation of wood."

TABLE XVII.—ACETIC ACID.

Station No.	Place of Sale.	Cost per 4 oz.	Specific gravity at 15° C.	Acetic Acid.	Fixed Impurities (gms. per 100 cc.).	Remarks.
		cts.		%		
27519	Bridgeport........	10	1.048	34.82	.013	
27520	Bridgeport........	10	1.019	12.60	.010	35% U. S. P.
27521	Bridgeport........	10	1.048	35.06	.018	
27625	Danbury...... ...	15	1.048	34.82	.305	Considerable chlorides.
27726	Hartford..........	15	1.049	35.27	.008	
27727	Hartford..........	20	1.047	34.14	.011	
27728	Hartford..........	20	1.049	35.63	.005	Formic and sulphurous acid present.
27576	Meriden..........	10	1.049	35.51	.315	Brown color; contains iron, lead, formic and sulphurous acids, and trace of empyreumatic substances.
25777	Meriden..........	10	1.040	28.18	.058	78.3% U. S. P.; contains empyreumatic substances and trace of sulphates.
27563	New Britain.......	15	1.049	35.48	.014	
27564	New Britain.......	20	1.049	35.45	.020	
26959	New Haven.......	20	1.049	35.60	.033	
26960	New Haven.......	15	1.050	36.02	.017	
27538	New Haven.......	10	1.040	28.51	.064	Contains empyreumatic substances and trace of sulphates. 79.2% U. S. P.
27539	New Haven.......	20	1.052	37.92	.016	
27652	New London......	15	1.049	35.81	.010	
27653	New London......	20	1.049	35.57	.012	
27662	New London......	25	1.049	35.51	.004	
27700	Norwich..........	10	1.049	35.69	.003	Contains trace of formic and sulphurous acid.
27701	Norwich..........	20	1.049	35.69	.006	
27591	Stamford..........	15	1.008	6.05	.015	16.8% U. S. P.
27592	Stamford..........	10	1.040	28.21	.026	78.4% U. S. P.; contains trace of chlorides.
27759	Waterbury........	20	1.049	35.39	.020	
27760	Waterbury........	25	1.049	35.51	.016	
27761	Waterbury........	15	1.044	31.10	.018	86.4% U. S. P.
	Sampled by Dairy Commissioner.					
6147	[1]A. L. Embree, Stamford........	..	.....	28.12	....	78.1% U. S. P.
6148	[2]Marron's Pharmacy, Stamford..	..	.....	34.32	....	
6170	[3]J. H. Clampett, Bridgeport......	..	.....	35.98	....	

[1] See 27592 above. [2] See 27591 above. [3] See 27520 above.

It should have a specific gravity of about 1.045 at 25° C. (equal to 1.048 at 15° C.), should leave no residue on evaporation, should be free from sulphuric, hydrochloric, formic and sulphurous acids, heavy metals and more than traces of empyreumatic substances.

Twenty-eight samples were analyzed. These contained from 6.05 to 37.92 per cent. acetic acid. Twenty-one samples contained approximately the standard percentage. The other seven contained 6.05, 12.60, 28.12, 28.18, 28.21, 28.51 and 31.10 per cent., respectively. Two of these, **27591** and **27520**, showed a great deficiency in acid, containing only 17 and 35 per cent. of the required amount.

Of the twenty-one samples containing over 34 per cent. of acetic acid four failed to comply strictly with the U. S. P. requirements, one containing high fixed impurities, mostly chlorides, two traces of formic and sulphurous acids, and one, **27576**, being of a decided brown color and containing high fixed impurities, iron, lead, formic and sulphurous acids and traces of empyreumatic substances.

To summarize, 17 samples were found to be of satisfactory quality, 4 of proper acid strength contained various impurities and 7 contained only from 17 to 86 per cent. of the required acid.

The three samples taken by the Dairy Commissioner were second samples from the stock of druggists found by the station to be selling this drug below standard strength, **6147**, corresponding to our **27592**, showed no change; **6148** and **6170**, corresponding to **27591** and **27520**, however, showed 34.32 and 35.98 per cent., respectively, where 6.05 and 12.60 were previously found, another indication that the three-sample feature of the law may put the dealer on guard and that the material sold does not necessarily represent what would be secured by the casual purchaser.

ACONITE.

(*Aconitum.*)

"The dried tuberous root of *Aconitum Napellus,* collected in autumn; yielding when assayed by the process given below (U. S. P. page 28), not less than 0.5 per cent. of aconitine."

Seven samples of the powdered root were analyzed.

Aconitine was determined by four methods, the U. S. P. gravimetric and volumetric and the A. O. A. C. gravimetric and volumetric (U. S. Dept. Agr., Bur. of Chem., Bull. *107*, 258). Neither gravimetric method is reliable because of the difficulty in securing a perfectly pure residue from the ether and chloroform extraction. The following tabulation of results shows that in certain cases the amount of impurity may be very considerable.

ACONITINE BY DIFFERENT METHODS.

Sample.	U. S. P. Method. Grav.	U. S. P. Method. Vol.	A. O. A. C. Method. Grav.	A. O. A. C. Method. Vol.
	%	%	%	%
27747	*.494	.384	.430	.371
27495	.335	.295	.301	.256
27548	*.383	.231	.308	.288
27658	.454	.397	.448	.359
27682	*.415	.231	*.387	.256
27705	†.725	.487	.581	.512
27588	.487	.397	.486	.410
Averages,	.470	.346	.420	.350

* Residue impure. †Residue very impure.

These results show very clearly the tendency towards high results by both gravimetric methods, and that there is little choice between the two volumetric methods as regards accuracy.

With the exception of **27705**, all the samples were deficient in the alkaloid, ranging from 0.231 to 0.397 per cent., or from 46.2 to 79.4 per cent. of the strength required by the U. S. P.

Total ash ranged from 4.52 to 6.05, and ash insoluble in hydrochloric acid (sand) from 0.13 to 1.30 per cent. There was a

TABLE XVIII.—ACONITE ROOT (POWDERED).

Station No.	Place of Sale.	Cost per 2 oz.	Weight sold for 2 oz.	Aconitine. U. S. P. method, Volumetric.	Aconitine. A. O. A. C. method, Volumetric.	Ash. Total.	Ash. Insoluble in HCl.
		cts.	oz.				
27747	*Hartford	15	2.2	0.384	0.371	6.05	0.72
27495	*†New Haven	10	1.8	0.295	0.256	5.47	1.23
27548	"	10	1.8	0.221	0.288	5.61	1.04
27658	New London	10	1.7	0.397	0.359	5.48	0.65
27682	"	20	2.4	0.231	0.256	5.62	1.30
27705	Norwich	10	1.8	0.487	0.512	5.36	0.31
27588	Stamford	20	1.8	0.397	0.410	4.52	0.13
	Average	*13.6*	*1.9*	*0.346*	*0.350*	*5.44*	*0.77*

* No Poison label. † Labeled "not pure."

relation between insoluble ash and aconitine, the higher percentages of alkaloid being associated with a low insoluble ash.

The samples were carelessly weighed at the time of sale. Although two ounces were asked for in every case, the amount delivered ranged from 1.7 to 2.4 ozs., at a cost of from 10 to 20 cents. Although the substance is actively poisonous two druggists neglected to affix a poison label to their samples.

POWDERED ASAFETIDA.

The Pharmacopœia requires that gum asafetida shall contain not less than 50 per cent. of matter soluble in alcohol and not more than 10 per cent. of ash.

The quality of gum asafetida is notoriously bad and that of the powdered drug is even worse. The literature shows that much inferior asafetida is imported into this country, some containing as much as 75 per cent. of ash. On the other hand numerous samples have been found containing over 70 per cent. of alcohol-soluble resins and less than 6 per cent. of ash.

Because of its gummy nature it is claimed that a diluent is necessary when asafetida is to be prepared in powdered form. However, an ash content of 40, 50 or even 65 per cent. is inexcusable, and can only be considered as an adulteration. (See page 204.)

Twenty-seven samples were analyzed, representing seventeen samples taken by us and ten duplicate samples collected by the Dairy Commissioner.

The alcohol-soluble matter ranged from 11.58 to 60.50 per cent., as follows:

9	samples	from	11.6 to 20.0	per cent.
10	"	"	20.1 to 30.0	"
5	"	"	30.1 to 40.0	"
2	"	"	40.1 to 50.0	"
1	"	"	60.5	"

In other words 15 of the 27 samples contained less than half of the required amount of alcohol-soluble matter. As a rule the low percentages of resins were associated with large amounts of ash. The last column of Table XIX shows the calculated amount of alcohol extract based on 10 per cent. of ash (the U. S. P. maxi-

TABLE XIX.—POWDERED ASAFETIDA.

Station No.	Label.	Place of Sale.	Weight, oz.		Selling Price.	Alcohol Extract.	Ash.			CaO.	SO₃.	Alcohol Extract on basis of 10 per ct. ash. (Calculated).
			Claimed.	Found.			Total.	Insoluble in water.	Insoluble in HCl.			
					cts.							
27530	Asafetida Powd.........	Bridgeport.........	2.0	2.0	20	41.34	34.73	31.00	1.92	*15.06	10.05	56.97
27944	Asafetida Powd.........	Bristol.............	1.0	0.9	25	19.46	49.58	46.20	1.53	20.89	24.33	34.74
27738	Asafetida Powd.........	Hartford...........	1.0	0.9	10	12.14	46.03	40.80	0.82	*19.67	22.88	20.25
27746	Asafetida Powd.........	Hartford...........	1.0	0.8	10	49.90	35.99	32.51	1.13	14.10	19.27	70.16
27973	Asafetida...............	Hartford...........	1.0	0.8	15	35.62	37.92	32.03	1.83	*17.39	10.41	51.66
27974	Asafetida...............	Hartford...........	1.0	0.8	25	15.02	63.03	51.74	0.87	*32.03	18.29	36.54
27975	Asafetida...............	Hartford...........	1.0	0.9	25	36.36	36.96	34.13	1.40	14.52	18.94	53.55
27976	Po. Asafetida...........	Hartford...........	1.0	1.0	15	24.26	50.02	44.51	1.50	*22.20	20.25	43.65
27572	Pow. Gum Asafetida ...	Meriden...........	1.0	0.8	10	27.12	48.64	42.96	2.62	*16.72	13.93	47.52
27959	Po. Asafetida...........	New Britain	1.0	1.0	15	27.56	52.22	47.09	1.18	*30.93	15.14	51.93
27960	Powd. Asafetida	New Britain........	1.0	0.8	20	23.58	46.43	43.63	4.44	18.41	19.74	39.60
27498	Asafetida...............	New Haven........	1.0	0.9	10	13.24	64.49	59.70	2.16	25.72	32.88	33.57
27752	Asafetida...............	New Haven........	1.0	0.9	10	25.52	45.23	40.32	2.47	*19.52	15.23	41.94
27681	Powd. Asafetida	New London.......	1.0	0.8	10	60.50	27.06	22.95	0.98	10.79	13.19	77.65
27586	Asafetida...............	Stamford	1.0	0.7	10	24.40	58.68	52.91	2.45	23.51	28.05	53.19
27786	Asafetida	Waterbury.........	1.0	0.9	15	34.80	28.11	24.77	1.54	*11.45	7.21	43.56
27788	Asafetida...............	Waterbury.........	1.0	1.1	10	11.78	67.84	63.29	1.27	27.17	34.97	32.94
		Average..........	...	...	..	*28.39*	*46.64*	*42.18*	*1.77*	*20.00*	*19.10*	*47.90*

* Contained considerable lime as carbonate.

mum for the gum). This shows approximately the amount of alcohol-soluble matter in gum of U. S. P. quality as regards ash. These calculated values ranged from 19.71 to 77.65 per cent., or

2 samples from 19.7 to 30.0 per cent.
8 " " 30.1 to 40.0 "
8 " " 40.1 to 50.0 "
9 " " 50.1 to 77.7 "

These figures indicate that in 9 samples the original gum was of U. S. P. quality, in 8 of fairly satisfactory quality, while in 10 it was decidedly inferior. Whatever justification there may be in the use of a certain amount of diluent in powdering the gum, the above figures show that in nearly half of the samples the gum itself was not of U. S. P. strength.

The total ash ranged from 27.06 to 67.84 per cent., the ash insoluble in water from 22.95 to 63.29 per cent. and that insoluble in hydrochloric acid (sand) from 0.82 to 2.62 per cent. The samples may be classed as follows on basis of total ash.

2 samples from 27.1 to 30.0 per cent.
5 " " 30.1 to 40.0 "
10 " " 40.1 to 50.0 "
3 " " 50.1 to 60.0 "
7 " " 60.1 to 67.8 "

Table XX.—Powdered Asafetida.

(Sampled by Dairy Commissioner.)

Sample No.	* Corresponding Station No.	Dealer.	Alcohol Extract.	Total Ash.	Alcohol Extract on basis 10 per cent. Ash (calculated).
6367	27498	Chas. Fleischner, New Haven.........	13.52	63.83	33.64
6368	27752	Chas. S. Leete & Co., New Haven.....	25.36	43.80	40.59
6388	27586	A. L. Embree, Stamford	34.28	49.33	60.89
6397	27944	P. N. Holley, Bristol................	21.40	49.12	37.89
6558	27572	W. W. Mosher, Meriden.............	26.00	46.24	43.52
6565	27974	Cantarow Drug Co., Hartford.........	15.26	66.94	41.58
6566	27975	Frank L. Palmer, Hartford...........	36.58	37.17	52.38
6567	27738	L. H. Tracy, Hartford................	11.58	47.08	19.71
6569	27959	E. L. Janeswick, New Britain.........	26.26	64.18	65.97
6585	27788	J. W. Cone, Waterbury..............	12.20	66.88	33.15

* See Table XIX.

No sample approached even the U. S. P. maximum and ten contained over 50 per cent. ash.

The ash consisted chiefly of calcium sulphate, in fourteen samples associated with considerable calcium carbonate.

The selling price showed the usual variations, ranging from 10 to 25 cents per ounce.

The ten second samples taken by the Dairy Commissioner (Table XX) ranged from 11.58 to 36.58 per cent. alcohol extract and from 37.17 to 66.94 per cent. ash; in other words none of the samples satisfied the U. S. P. requirements. With one exception the analyses of these samples agreed reasonably well with those of the corresponding station samples.

SYRUP OF FIGS.

This proprietary has been on the market for a number of years. It was formerly sold as "Syrup of Figs," but of late years many of the labels note the presence of "Elixir of Senna," which is generally the real laxative agent present. The reason for this change is apparent from the following extract from the opinion of the U. S. Court in the case, Worden v. California Fig Syrup Co., 187 U. S., 516, 536:

> "The argument for complainant is that, because fig juice or syrup has no laxative property, everybody ought to understand that when the term is used to designate a laxative medicine it must have only a fanciful meaning. But the fact is admitted that the public believe that fig juice or syrup has laxative medicinal properties. It is to them that the complainant seeks to sell its preparations, and it is with respect to their knowledge and impression that the character, whether descriptive or fanciful, of the term used, is to be determined."

While whole figs do have a laxative effect, due largely to the mechanical effect of the seeds and skins, there is no evidence that a decoction of figs has any such action whatever. The public should understand that in the preparations under discussion the laxative agent is not figs, but, generally, senna, often associated with Rochelle or Epsom salts, which relieve the griping often resulting from the use of the senna alone.

Thirteen samples were analyzed, six of which were sold as compound fig syrup, five as compound fig and senna syrup, and two as fruit laxative.

TABLE XXI.—SYRUP OF FIGS.

Station No.	Brand.	Cost per bottle.	Specific gravity at 25° C.	Alcohol by weight.	Solids.	Ash.		Sugar, by Clerget.	Polarization.		
						Total.	Water-Insoluble.		Direct.	After Inversion.	Temperature ° C.
		cts.									
27533	Amer. Druggists Syndicate, N. Y.	25	1.294	1.46	63.08	0.69	0.26	56.01	54.6	—17.6	29
26943	California Fig Syrup Co., San Francisco	45	1.235	4.01	52.20	0.82	0.33	42.70	41.6	—14.1	24.5
27517	Dist. by Cosmopolitan Pharmacy, Bridgeport	35	1.303	1.88	60.35	1.18	0.34	44.90	46.8	—12.8	20
27516	Prep. for H. A. Dupee, Bridgeport	25	1.235	2.79	51.20	1.18	0.33	35.65	33.2	—12.8	26
27514	Prep. for J. A. Leverty & Bro., Bridgeport	25	1.293	4.72	63.42	0.76	0.09	55.36	53.4	—17.8	29
27515	New York & London Drug Co., N. Y.	20	1.268	9.63	57.84	4.92	0.26	42.00	41.6	—12.5	26
27779	North American Remedy Co., Philadelphia	25	1.285	4.78	62.15	0.74	0.12	52.21	50.8	—16.5	29
27535	Peninsula Chem. Co., Detroit	25	1.280	1.50	62.27	1.99	0.21	44.38	44.8	—14.1	20
26949	Dr. Hobson's. Pfeiffer Chem. Co., Philadelphia	25	1.262	0.00	57.44	0.80	0.36	*11.43	2.2	—12.5	29
26940	Riker Drug Stores, New York	35	1.314	1.46	65.09	0.47	0.26	61.28	61.0	—18.9	24.5
27518	Rexall. United Drug Co., Boston	45	1.270	2.91	61.07	0.63	0.31	44.33	42.4	—14.7	29
27568	Vita Drug Co., Boston	25	1.287	1.16	60.70	1.21	0.36	53.91	53.0	—16.5	29
27534	Henry S. Wampole Co., Baltimore	35	1.234	2.36	54.82	0.21	0.08	42.10	41.2	—13.2	29

* Also 33.61 per cent. invert sugar.

Brand Names.

27533. Premium Remedy for Constipation, A Vegetable Laxative, A. D. S. Fig Syrup Comp., Alcohol 3 per cent.

26943. Syrup of Figs and Elixir of Senna, Contains 6 per cent. of Alcohol.

27517. Laxative Fig Syrup and Compound Synergists, .03 Alcohol.

27516. Fig and Senna Laxative Compound Syrup, Alcohol 5 per cent.

27514. Compound Fig Laxative Syrup, Contains about 8 per cent. Alcohol.

27515. Nyal's Compound Laxative Fig Syrup, Alcohol 16 per cent. "A Purely Vegetable Laxative."

27779. Narco Fig Laxative Syrup, Contains about 8 per cent. Alcohol.

27535. Penslar Compound Laxative Fig and Senna Syrup, Alcohol 2 per cent. "Each fluidounce contains Senna, 175 grs., Rochelle Salts, 20 grs., Syrup of Figs, 80 Min."

26949. Dr. Hobson's Laxative Fig Syrup Compound, with Senna and other Vegetable Laxatives.

26940. Riker's Compound Syrup of Senna and Figs, 2½ per cent. Alcohol.

27518. Rexall Fruit Laxative, Containing 14 per cent. Alcohol.

27568. Vita Compound Fruit Laxative Syrup, 2 per cent. Alcohol. "Syrup Figs and Raisins, Syrup Prunes, Senna, Mandrake, Rhubarb, etc."

27534. Laxative Fig Syrup and Senna Compound, Alcohol 5 per cent.

With one exception all the samples contained alcohol ranging from 1.16 to 9.63 per cent. The solids ranged from 51.20 to 65.09 per cent., chiefly consisting of cane sugar, except in **26949**, where 11.43 per cent. cane sugar and 33.61 per cent. invert sugar were present; in the other samples the sugar ranged from 35.65 to 61.28 per cent., constituting from 70 to 94 per cent. of the solids.

The ash ranged from 0.21 to 4.92 per cent., while the water-insoluble ash ranged from 0.08 to 0.36 per cent. An examination of the ash showed traces of chlorides, lime, magnesium, phosphates, sulphates, and iron in all samples. Chlorides were found in considerable amount in **27515**, **27535** and **25779**; magnesia in **27515**, **27516**, **27517**, **27518** and **27568**; and sulphates in **27515**, **27516**, **27517**, **27535** and **27568**. In four of these samples, **27515**, **27516**, **27517** and **27568**, magnesium sulphate (Epsom salt) was present, while **27518** contained an unidentified magnesium salt. In **27535** Rochelle salt was present. It is apparent, therefore, that the cathartic action was not in all cases derived solely from vegetable drugs, as claimed for some of the brands.

Generally speaking, since syrup of figs confessedly has no laxative property, it would seem to be a species of misbranding to give the words "fig syrup" so much prominence on the label of laxative remedies of this nature. By the manufacturer's own label in one case only 80 minims of syrup of figs is claimed per fluidounce, or 16 per cent., while 40 per cent. of senna is claimed. A statement made on the label of the California Fig Syrup Co. is illuminating in this respect. "This excellent remedy, well and favorably known under the name of Syrup of Figs, will in future be designated Syrup of Figs and Elixir of Senna, as the latter name is more fully descriptive of the combination, because its laxative principles are obtained from Senna, which is the best of natural laxatives, while the figs of California are used to promote the pleasant taste." There is, therefore, evidently no more reason why the word "fig" should appear on the labels of these preparations than the name of any other flavoring ingredient used, such as cassia, cloves or mint. The word "fig" is used with all the preparations except the Rexall and Vita products, which are called "Fruit Laxatives," a nomenclature just as objectionable, as in neither case is the main laxative effect secured from any fruit which may be present.

By subtracting the sum of the sugars and ash from the total solids, we get a close approximation to the amount of vegetable extractive present, assuming, of course, the absence of glycerine for which we made no tests. This figure ranges from 3.34 to 16.11 per cent., six samples containing less than 10 per cent.

When we consider the samples individually we find more specific criticisms necessary. The A. D. S. preparation, **27533**, bears the usual statement, "This is not a patent medicine, etc.," which raises the question whether a preparation made by a druggist or a group of druggists may not be quite as much a patent medicine as if made by a quack doctor or a seemingly reputable house.

In **27517** we find considerable Epsom salt. The brand name claims the presence of "synergists." Synergy, medically speaking, is "the combined healthy action of every organ of a system." The claim for the presence of such substances is certainly a most sweeping one.

In **27516** we also find considerable Epsom salt.

The Nyal preparation, **27515**, claiming to be a purely vegetable laxative, contains 4.92 per cent. ash, a considerable portion of which is Epsom salt. It is therefore not "purely vegetable" and much of its laxative action depends upon a mineral cathartic. It contains 9.63 per cent. of alcohol by weight, more than double the amount found in any of the other samples.

27535, Penslar Syrup, contains Rochelle salt as claimed, also considerable chlorides and sulphates, indicating the use of other mineral drugs.

26940, Riker's Syrup, contains only 3.34 per cent. of solids, other than sugar and ash, 94 per cent. of its solids consisting of sugar. This contains less vegetable extractives than any other of the group.

27518, Rexall Fruit Laxative, contains a magnesium salt, to which part of its laxative action is probably due.

27568, Vita Syrup, contains considerable Epsom salt, which is not mentioned in its formula, and which is certainly not a "fruit," to which the manufacturer attributes the laxative effect of his preparation.

GLYCERINE.

(*Glycerinum.*)

Glycerine of U. S. P. strength should contain not less than 95 per cent. of absolute glycerine, should have a specific gravity not less than 1.246 at 25° C. (= 1.2526 at 15° C.), should be neutral to litmus paper, should be free from mineral impurities, sugars, butyric acid and acrolein.

Thirty samples were analyzed.

The specific gravity at 15° C. ranged from 1.2469 to 1.2630; absolute glycerine from 93.0 to 99.2.

Sugar was present in small quantity in one sample.

Butyric acid was present in all samples. but in nine cases only in traces.

Acrolein was absent in one sample, present in traces in sixteen, and in relatively considerable amounts in thirteen.

Arsenic was present in traces in ten samples.

No oxalic acid, calcium, chlorides or sulphates were detected in any sample.

The cost of four ounces ranged from 15 to 35 cents.

TABLE XXII.—GLYCERINE.

Station No.	Place of Sale.	Cost per 4 oz.	Specific gravity at 15° C.	Glycerine.	Sugars.	Butyric Acid.	Acrolein.	Arsenic.
		cts.						
27503	Bridgeport	25	1.2502	94.0	None	Yes	Trace	None
27526	Bridgeport	25	1.2620	98.8	None	Trace	None	None
27527	Bridgeport	20	1.2515	94.6	Yes	Yes	Yes	None
27528	Bridgeport	15	1.2542	95.6	None	Yes	Trace	None
27529	Bridgeport	15	1.2556	96.2	None	Yes	Yes	None
27623	Danbury	20	1.2517	94.6	None	Yes	Trace	None
27632	Danbury	20	1.2542	95.6	None	Yes	Trace	None
27635	Danbury	35	1.2493	93.6	None	Yes	Trace	Trace
27723	Hartford	15	1.2510	94.4	None	Yes	Yes	None
27724	Hartford	20	1.2575	97.0	None	Yes	Trace	Trace
27725	Hartford	15	1.2548	96.0	None	Yes	Yes	Trace
27729	Hartford	20	1.2592	97.6	None	Trace	Trace	Trace
27581	Meriden	15	1.2599	98.0	None	Trace	Trace	Trace
27582	Meriden	15	1.2629	99.2	None	Trace	Yes	None
27565	New Britain	20	1.2516	94.6	None	Yes	Yes	None
27566	New Britain	20	1.2555	96.2	None	Yes	Yes	Trace
26961	New Haven	20	1.2540	95.6	None	Yes	Trace	Trace
27494	New Haven	15	1.2588	97.6	None	Trace	Trace	Trace
27545	New Haven	20	1.2514	94.6	None	Yes	Yes	None
27546	New Haven	20	1.2547	95.8	None	Yes	Trace	None
27547	New Haven	25	1.2570	96.8	None	Yes	Trace	None
27654	New London	30	1.2630	99.2	None	Trace	Trace	Trace
27656	New London	35	1.2515	94.6	None	Yes	Yes	None
27702	Norwich	25	1.2597	98.0	None	Yes	Trace	None
27714	Norwich	25	1.2580	97.2	None	Trace	Trace	None
27589	Stamford	20	1.2520	94.8	None	Yes	Yes	None
27590	Stamford	15	1.2555	96.2	None	Yes	Yes	None
27766	Waterbury	15	1.2557	96.2	None	Yes	Trace	Trace
27767	Waterbury	25	1.2469	93.0	None	Trace	Yes	None
27768	Waterbury	20	1.2552	96.0	None	Trace	Yes	None
	Average	*20.8*	*1.2552*	*96.1*	......	......	......	......

HEROIN.

Heroin, diacetyl morphine, is a morphine derivative, which has recently come into use to an alarming extent as a substitute for cocaine and similar habit-forming drugs. The abuse of the drug has become so great that at least one city in this state, New Haven, has passed an ordinance forbidding its sale except on prescription, or for purely professional or scientific purposes. Four samples were purchased by our collector, whose identity was unknown to the druggists in question, the latter making no inquiries whatever as to the purpose of the purchase. While the sale of these samples was not illegal at the time, it is obviously easy for a perfect stranger to purchase this dangerous drug without a prescription in at least four of our cities.

The samples contained from 4.03 to 19.75 per cent. of heroin, equivalent to 0.068 to 0.172 of a grain per tablet, one showing a shortage of .015 of a grain, or 18 per cent.

TABLE XXIII.—HEROIN TABLETS.

Station No.	Dealer.	Cost per Sample.	No. of Tablets.	Net weight of Tablets.	Heroin.		
					Per cent.	Grains per Tablet found.	Grains per Tablet claimed.
		cts.		gm.			
27740	Pike's Drug Store, Hartford	10	12	1.118	6.02	.087	.083
27551	J. A. Notkin & Bro., New Haven	20	12	0.651	19.75	.172	.167
27685	Starr Bros., New London	15	12	1.238	4.98	.078	.083
27704	Smith Pharmacy, Norwich	25	12	1.312	4.03	.068	.083

MAGNESIUM CARBONATE.

(*Magnesii Corbonas.*)

"Magnesium carbonate should yield, upon ignition, not less than 40 per cent. of residue, of which not less than 96 per cent. should consist of pure magnesium oxide."

One grain should not contain more than 0.001 gm. of foreign soluble salts. It should not contain more than mere traces of lime, iron or other heavy metals.

Magnesium carbonate of a quality not strictly satisfying U. S. P. requirements is frequently sold marked "For technical use." The difficulty and expense of completely removing certain foreign salts greatly increases the cost of the substance, still as long as the U. S. P. is our standard for drug purity the druggist should adhere to that standard for the drugs he sells. Should the dealer sell this drug in the original package plainly marked "For technical use," he can hardly be criticized for selling an impure article, for he sells it for what it is. However, when selling the "technical" grade in bulk it should be so labeled as to give the purchaser full knowledge of its inferior quality.

Nine of the eighteen samples analyzed came in their original wrappers, and seven of these were branded "technical." One sample each of Pattison's, Lehn & Fink's and all the bulk samples were sold as "Magnesium Carbonate" and should have met the U. S. P. requirements.

One sample, **27713**, proved to be oxide, not carbonate of magnesia. The other seventeen samples on ignition gave residues from 40.78 to 42.03 per cent., and contained from 38.88 to 40.52 per cent. of pure magnesium oxide, all satisfying the U. S. P. standards in both respects. All the samples, however, contained considerable foreign soluble salts, ranging from 0.62 to 1.07 per cent. Iron was found in traces or more in all samples, while lime was found in three samples.

While all the samples contained the proper amounts of the important ingredient, magnesium oxide, none of them was strictly in conformity with the rather exacting U. S. P. requirements.

Some of the samples showed quite a shortage in weight. Four ounces were asked for in every case, but the amounts delivered ranged from 3.3 to 4.4 ounces. Seven samples were short by 0.4 of an ounce or over, equivalent to 10 per cent. or more. The price ranged from 10 to 20 cents.

SOLUTION OF MAGNESIUM CITRATE.

(*Liquor Magnesii Citratis.*)

The U. S. P. formula for this preparation yields a product which contains, in 100 cc. of the solution, 1.60 gms. magnesium oxide, 0.33 gm. potassium oxide, 9.28 gms. total citric acid and 3.24 gms. free citric acid.

Forty-three samples were analyzed, thirty-one of our own collection and twelve from the Dairy Commissioner. These showed a wide range in composition. The thirty-one samples contained from 3.50 to 10.50 gms. total and from 0.18 to 3.81 gms. free citric acid 100 cc., from 0.72 to 1.91 gms. magnesium oxide, and from none at all to 0.40 gm. potassium oxide. All the samples contained traces of lime, ten from 0.05 to 0.11 gm. Twenty-nine showed strong, one slight and one no effervescence on opening. A lemon odor was strong in twenty-one samples, slight in five, and none detected in five. In twenty-five samples the solution was clear, in five slightly turbid and in one distinctly turbid. In all the samples there was some sediment;

TABLE XXIV.—MAGNESIUM CARBONATE.

Station No.	Brand, or Place of Sale.	Weight.		Cost per 4 oz. (claimed).	Residue on Ignition.	Magnesium Oxide.	Foreign Soluble Salts.	Impurities Detected.
		Claimed.	Found.					
		oz.	oz.	cts.				
27512	*Keasbey & Mattison Co., Ambler, Pa.	4.0	4.2	20	41.53	39.60	0.78	Iron.
27554	*Keasbey & Mattison Co., Ambler, Pa.	4.0	3.3	15	42.03	40.52	0.62	Traces lime and iron.
27555	*Keasbey & Mattison Co., Ambler, Pa.	4.0	3.4	15	40.79	39.49	0.80	Iron and trace lime.
27637	*Keasbey & Mattison Co., Ambler, Pa.	4.0	4.0	15	40.78	38.88	1.04	Iron.
27712	*Keasbey & Mattison Co., Ambler, Pa.	4.0	3.7	15	41.34	39.70	0.61	Iron.
27513	Lehn & Fink, New York	4.0	3.7	20	41.07	39.29	0.93	Iron.
27585	*Schieffelin & Co., New York	4.0	3.4	15	41.17	39.60	0.86	Iron.
27567	*Pattison's, Washington Chem. Co., Engl.	4.0	4.4	10	41.25	40.11	0.77	Trace iron.
27575	*Pattison's, Washington Chem. Co., Engl.	4.0	3.6	15	41.35	40.00	0.69	Trace iron.
27744	In bulk. Hartford	4.0	4.1	10	41.72	39.90	0.76	Trace iron.
27749	" "	4.0	3.7	10	41.98	40.52	0.84	Trace iron.
27499	" New Haven	4.0	3.6	10	41.05	39.60	1.07	Iron.
27556	" "	4.0	3.7	15	41.64	39.90	0.68	Trace iron.
27750	" "	4.0	3.5	10	41.91	40.21	0.79	Iron.
27684	" New London	4.0	4.1	10	41.68	40.21	0.82	Trace iron.
27713	" Norwich	4.0	3.5	10	96.93	93.93	0.80	Trace iron; oxide, not carbonate, magnesia.
27780	" Waterbury	4.0	3.7	10	41.58	40.01	0.78	Iron.
27781	" "	4.0	3.7	10	41.74	39.80	0.67	Iron and lime.
	Average (excluding 27713)	*4.0*	*3.8*	*13.2*	*41.45*	*39.84*	*0.79*	

* Labeled, "Technical."

in eight this was very slight, in thirteen slight, in seven considerable and in three very heavy.

This solution is liable to deteriorate in appearance on keeping even for a short time, losing its clear, bright appearance and a precipitate of potassium bicarbonate frequently settling out. Furthermore, from its composition it is a particularly favorable medium for bacterial and fungus growth. For these reasons it should be made up in small lots only sufficient for immediate demands, or as directed in the U. S. P. "This preparation should be freshly made when wanted." It does not seem that age should impair its strength in magnesia and potash, but long keeping results in loss of acidity and carbonic acid gas, with an accom-

TABLE XXV.—SOLUTION OF CITRATE OF MAGNESIA.

(Grams per 100 cc.)

Station No.	Place of Sale.	Price per bottle.	Citric Acid.		Magnesium Oxide.	Potassium Oxide.	Calcium Oxide.	Effervescence.	Lemon Odor.	Appearance of Solution.	Character of Sediment.
			Total.	Free.							
		cts.									
27505	Bridgeport	20	8.19	2.28	1.68	0.35	Tr.	Yes	Yes	Clear	Slight.
27506	Bridgeport	25	9.42	3.26	1.71	0.36	Tr.	Yes	No	Clear	Slight.
27507	Bridgeport	25	7.98	2.56	1.52	0.36	Tr.	Yes	Slight	Clear	Very slight.
27508	Bridgeport	20	7.77	1.88	1.70	0.35	Tr.	Yes	Yes	Clear	Slight.
27633	Danbury	25	3.50	0.84	0.72	0.36	Tr.	Yes	Yes	Turbid	Slight.
27634	Danbury	25	7.63	2.59	1.38	0.30	Tr.	Yes	Slight	Clear	Very slight.
27715	Hartford	25	5.88	0.18	1.50	0.36	0.06	Yes	Yes	Clear	Heavy, lumpy.
27716	Hartford	20	6.79	2.45	1.10	0.32	Tr.	Yes	Yes	Clear	Slight.
27717	Hartford	20	7.84	2.68	1.38	0.38	0.05	Yes	Yes	Clear	Considerable.
27718	Hartford	25	7.21	2.34	1.25	0.35	Tr.	Yes	No	Clear	Considerable.
27583	Meriden	25	10.50	3.81	1.91	0.00	....	No	Yes	Clear	Considerable.
27584	Meriden	25	10.50	3.38	1.90	0.34	0.07	Yes	Yes	Clear	Slight.
27559	New Britain	25	5.95	1.30	1.35	0.24	Tr.	Yes	Yes	Clear	Very slight.
27560	New Britain	25	8.26	2.27	1.68	0.26	0.07	Yes	Yes	Clear	Considerable.
26950	New Haven	25	8.68	2.73	1.56	0.36	Tr.	Yes	Yes	Sl. turbid	Slight.
26951	New Haven	25	6.76	1.40	1.56	0.34	Tr.	Yes	Yes	Clear	Heavy.
26952	New Haven	20	5.50	1.98	0.97	0.38	Tr.	Yes	Yes	Clear	Very slight.
26953	New Haven	25	4.97	0.91	1.07	0.33	Tr.	Yes	Yes	Sl. turbid	Slight.
27552	New Haven	25	7.49	3.68	1.04	0.38	Tr.	Yes	Yes	Clear	Very slight.
27553	New Haven	25	8.54	2.66	1.61	0.35	Tr.	Yes	No	Clear	Slight.
27670	New London	25	5.60	1.88	0.97	0.39	Tr.	Yes	Yes	Clear	Very slight.
27671	New London	25	8.89	3.08	1.58	0.31	Tr.	Yes	Slight	Sl. turbid	Considerable.
27687	Norwich	25	6.30	1.41	1.42	0.36	Tr.	Yes	Slight	Sl. turbid	Heavy.
27688	Norwich	25	9.10	3.17	1.48	0.35	0.09	Yes	Yes	Sl. turbid	Slight.
27595	Stamford	25	7.28	1.44	1.55	0.37	0.06	Yes	Yes	Clear	Slight.
27596	Stamford	25	7.56	1.86	1.56	0.29	Tr.	Yes	Yes	Clear	Very slight.
27754	Waterbury	25	6.37	1.44	1.29	0.28	0.05	Yes	No	Clear	Considerable.
27755	Waterbury	25	8.12	2.56	1.57	0.40	Tr.	Slight	No	Clear	Considerable.
27756	Waterbury	25	5.53	1.37	1.07	0.36	0.07	Yes	Yes	Clear	Very slight.
27757	Waterbury	25	6.58	1.05	1.47	0.34	0.11	Yes	Slight	Clear	Slight.
27758	Waterbury	25	6.79	2.30	1.19	0.31	0.09	Yes	Yes	Clear	Slight.
	Average	..	7.34	2.15	1.41	0.33	...	....	....	....	....

panying precipitation of potassium bicarbonate, which seriously affects its appearance, if not its efficacy.

Total citric acid ranged from 3.50 to 10.50 gms. per 100 cc.

7 contained from 8.4 to 10.5 gms., or 90 to 113 per cent. U. S. P.
10 contained from 7.4 to 8.3 gms., or 80 to 89 per cent. U. S. P.
6 contained from 6.4 to 7.3 gms., or 70 to 79 per cent. U. S. P.
8 contained from 3.5 to 6.3 gms., or 38 to 68 per cent. U. S. P.

Free citric acid ranged from 0.18 to 3.81 gms.

6 contained from 2.9 to 3.8 gms., or 90 to 117 per cent. U. S. P.
7 contained from 2.5 to 2.8 gms., or 77 to 86 per cent. U. S. P.
4 contained from 2.1 to 2.4 gms., or 65 to 74 per cent. U. S. P.
14 contained from 0.2 to 2.0 gms., or 6 to 62 per cent. U. S. P.

Magnesium oxide ranged from 0.72 to 1.91 gms.

17 contained from 1.44 to 1.91 gms., or 90 to 119 per cent. U. S. P.
5 contained from 1.28 to 1.43 gms., or 80 to 89 per cent. U. S. P.
2 contained from 1.12 to 1.27 gms., or 70 to 79 per cent. U. S. P.
6 contained from 0.96 to 1.11 gms., or 60 to 69 per cent. U. S. P.
1 contained 0.72 gm., or 45 per cent. U. S. P.

Potassium oxide ranged from none to 0.40 gm.

26 contained from 0.30 to 0.40 gm., or 90 to 121 per cent. U. S. P.
3 contained from 0.26 to 0.29 gm., or 80 to 89 per cent. U. S. P.
1 contained 0.24 gm., or 73 per cent. U. S. P.
1 contained 0.00 gm., or 0 per cent. U. S. P.

Allowing a variation of ten per cent. from the U. S. P. standard, that is, 8.35 total and 2.92 free citric acid, 1.44 magnesia and 0.30 gm. potash per 100 cc., the following table summarizes our analyses:—

4 samples within 10 per cent. U. S. P.
2 samples low in free citric acid.
1 sample low in potash.
8 samples low in total and free citric acid.
1 sample low in total citric acid and magnesia.
11 samples low in total and free citric acid and magnesia.
2 samples low in total and free citric acid and potash.
2 samples low in all four ingredients.

That is, only four samples were entirely satisfactory, while twenty-four were deficient in total citric acid, twenty-five in free citric acid, fourteen in magnesia and five in potash. Sample

27583, otherwise of full U. S. P. strength, contained no potash whatever. The above results indicate that this solution was quite carelessly prepared by druggists, especially with respect to the citric acid and magnesia; also that in a number of instances the druggists dispensed stock not freshly prepared as is required by the U. S. P.

Table XXVI.—Solution of Citrate of Magnesia (Dairy Commissioner's Samples).

(Grams per 100 cc.)

Sample No.	Corresponding to Station Sample No.	Dealer.	Magnesium oxide.	Potassium oxide.	Per cent. U. S. P. strength.	
					MgO.	K_2O.
*5210	.....	S. N. Rubin, Hartford	0.86	0.19	54	58
6366	26953	J. A. Caryl, New Haven	1.73	0.33	108	100
6369	26952	Goldberg's Pharmacy, New Haven	0.94	0.23	59	70
6382	27670	Nichols & Harris, New London	1.12	0.39	70	118
6386	27687	West Side Drug Store, Norwich	1.25	0.36	78	109
6559	27583	V. W. Schmelzer, Meriden	1.71	0.38	107	115
6564	27717	J. M. Rosenthal, Hartford	1.07	0.38	67	115
6568	27559	Chas. Scherp, New Britain	1.43	0.26	89	79
†6583	27758	E. M. Roberts, Waterbury	1.72	0.48	108	145
6587	27756	Henry Picarelli, Waterbury	1.24	0.38	78	115
6588	27754	J. A. Urba, Waterbury	1.26	0.26	79	79
6598	27633	Doran's Drug Store, Danbury	1.76	0.31	110	94

* Contained 4.64 per cent. total and 1.06 free citric acid.

† Heavy precipitate of potassium bicarbonate present.

With one exception the twelve samples analyzed for the Dairy Commissioner were taken from drug stores where a short time before we had purchased substandard samples of this preparation. In these samples, except **5210**, only magnesia and potash were determined. **5210** proved to be only slightly over 50 per cent. U. S. P. strength, there apparently being little effort made to follow the formula. Of the other eleven samples four were within 10 per cent. of the U. S. P. standard, four were deficient in magnesia, one in potash, and two in both of these ingredients. In only three cases do the analyses of these second samples agree satisfactorily with those of our own sampling. This indicates either that the druggists do not always follow a definite formula, or that they are careless in compounding their solutions, or that, knowing from the purchase of the three samples as required by law the reason for the purchase, they doctor the solution as the occasion may require. This we know to be the case in at least one of these samples. The station's sample certainly more fairly represents what the average purchaser receives.

Methods of Analysis.

Note the appearance of the sample as regards clearness, color, odor, amount of precipitation, etc. On opening note effervescence and gas presssure. Shake the sample thoroughly and empty into a large beaker. To hasten discharge of free carbonic acid pour rapidly from one beaker to another until effervescence ceases. Return liquid to the original container, shaking thoroughly each time before removing portions for analysis. Express results of analysis in grams per 100 cc.

Acidity (free or uncombined, excluding carbonic acid). Heat 25 cc. of solution to boiling in a porcelain casserole to remove last traces of carbonic acid and dilute to 50 cc. Titrate with half-normal sodium hydroxide solution, using phenolphthalein as indicator, and expressing the result as citric acid.

Total Citric Acid. Dilute 5 cc. of solution to 25 cc., and precipitate with excess of basic lead acetate solution; filter, and wash with dilute alcohol until the filtrate gives but a slight reaction for lead. Remove precipitate from filter, suspend in hot water and pass a rapid stream of hydrogen sulphide through to precipitate the lead. Filter off the black lead sulphide and wash with hot water. Boil the filtrate to remove excess of hydrogen sulphide and after cooling make up to 250 cc. Titrate an aliquot of 50 cc., equal to 1 cc. of original solution, with tenth-normal sodium hydroxide solution, using phenolphthalein as indicator.

Iron, Alumina and Phosphoric Acid. Evaporate 25 cc. of solution to dryness and ignite residue. Dissolve this in dilute hydrochloric acid and filter. Precipitate iron, alumina and phosphoric acid with ammonia, wash, dry and weigh.

Lime. Precipitate the filtrate from the preceding with ammonium oxalate and weigh as calcium oxide.

Magnesia. Evaporate filtrate from lime determination, remove ammonium salts by ignition and precipitate the magnesia with sodic phosphate, weighing as magnesium pyrophosphate. If only traces of iron, alumina, phosphoric acid and lime are present, the magnesia may be rapidly determined by evaporating 10 cc. of the solution, igniting the residue and dissolving same in hydrochloric acid, from which the magnesia may be precipitated directly by adding sodic phosphate and ammonia, weighing as the pyrophosphate.

Potash. Evaporate 25 cc. of solution, char residue and extract with hot dilute hydrochloric acid. Cool filtrate and make up to 100 cc. Evaporate an aliquot of 25 cc. to dryness in a platinum dish, and determine potash as in the Lindo-Gladding method.

OPIUM.

The U. S. P. standard for gum opium is not less than 9 per cent. of crystallized morphine, and for powdered opium not less than 12 per cent. nor more than 12.5 per cent. of crystallized morphine, when assayed by the U. S. P. method.

One sample of the gum and five of powdered opium were analyzed. The gum contained 11.3 per cent. of morphine and the powdered samples from 13.0 to 13.9 per cent. Two samples bore no poison label.

Morphine was determined by Eaton's method (Bur. of Chem., Bull. *137*, p. 189).

TABLE XXVII.—OPIUM (GUM AND POWDERED.)

Station No.	Place of Sale	Cost per oz.	Weight sold for 1 oz.	Morphine.
	Gum.	cts.	oz.	per cent.
27531	Bridgeport	100	1.0	11.3
	Powdered.			
27745	*Hartford	85	0.8	13.4
27751	New Haven	85	1.0	13.7
27680	New London	100	0.9	13.9
27706	Norwich	100	0.9	13.8
27785	*Waterbury	85	0.8	13.0
	Average of powdered opium	*91*	*0.9*	*13.6*

* Not labeled poison.

PAREGORIC.

(*Tinctura Opii Camphorata.*)

A preparation of camphorated tincture of opium, more commonly known as paregoric, was made in the laboratory strictly according to the U. S. P. formula. This analyzed as follows:—

Specific gravity at 15.5° C.	0.9511
Alcohol by volume	45.65
Morphine gms. per 100 cc.	0.0524
Morphine grains per fluid ounce	0.240

TABLE XXVIII.—PAREGORIC.

Station No.	Place of Sale.	Cost per 4 oz., cts.	Specific gravity at 15.5° C.	Alcohol by volume.	Morphine		Per cent. of Minimum U.S.P. strength.
					Grams per 100 cc.	Grains per fluidounce.	
	Laboratory Sample	....	.9511	45.65	.0524	.240	105.3
27504	Bridgeport	20	.9525	......	.0480	.222	97.4
27522	"	25	.9585	......	.0552	.255	111.8
27523	"	25	.9536	......	.0468	.216	94.7
27524	"	25	.9564	......	.0492	.227	100.0
27525	"	20	.9499	......	.0504	.233	102.2
27624	Danbury	35	.9510	......	.0456	.210	92.1
27626	"	35	.9263	52.15	.0516	.238	104.4
27631	"	35	.9530	......	.0504	.233	102.2
27719	Hartford	25	.9410	48.39	.0504	.233	102.2
27720	"	20	.9688	40.94	.0492	.227	100.0
27721	"	25	.9511	......	.0504	.233	102.2
27722	"	20	.9490	......	.0444	.205	89.9
27730	"	15	.9541	......	.0480	.222	97.4
27578	Meriden	25	.9460	......	.0528	.242	106.1
27579	"	25	.9500	......	.0528	.242	106.1
27580	"	25	.9519	......	.0444	.205	89.9
27561	New Britain	35	.9519	......	.0510	.235	103.1
27562	"	20	.9559	......	.0504	.233	102.2
26955	New Haven	25	.9533	......	.0420	.194	85.1
26956	"	20	.9510	......	.0480	.222	97.4
26957	"	20	.9547	......	.0345	.159	69.7
26958	"	20	.9561	......	.0528	.242	106.1
27540	"	20	.9455	......	.0480	.222	97.4
27541	"	20	.9500	......	.0456	.210	92.1
27542	"	20	.9522	......	.0504	.233	102.2
27543	"	20	.9550	......	.0552	.255	111.8
27544	"	20	.9269	56.37	.0528	.242	106.1
27655	New London	35	.9522	......	.0504	.233	102.2
27679	"	30	.9500	......	.0390	.180	78.9
27696	Norwich	25	.9513	......	.0480	.222	97.4
27697	"	30	.9529	......	.0504	.233	202.2
27698	"	25	.9555	......	.0552	.255	111.8
27707	"	25	.9507	......	.0645	.298	130.7
27593	Stamford	20	.9511	......	.0432	.199	87.8
27594	"	20	.9555	......	.0450	.208	91.2
27762	Waterbury	15	.9469	......	.0391	.180	78.9
27763	"	25	.9563	......	.0492	.227	100.0
27764	"	35	.9483	......	.0480	.222	97.4
27765	"	25	.9515	......	.0552	.255	111.8
	Average	*24.4*	*.9510*	......	*.0489*	*.226*	*99.1*

This proved to be somewhat stronger in morphine than the U. S. P. minimum, or 105.3 per cent.

Thirty-nine samples were analyzed. Alcohol was determined only in those samples in which the specific gravity varied materially from that of the laboratory sample. In these four samples the alcohol ranged from 40.94 to 56.37, the gravities ranging inversely from 0.9688 to 0.9263.

The specific gravities of all the samples ranged from 0.9263 to 0.9688, average 0.9510.

Morphine ranged from 0.0345 to 0.0645 gms. per 100 cc. or from 0.159 to 0.255 grains per fluidounce, equivalent to 69.7 to 111.8 per cent. of minimum U. S. P. strength. The morphine content may be summarized as follows:—

19 from .0494 to .0645 gms. per 100 cc., or .228-.298 grs. per fl. oz., or 100-131 per cent. min. U. S. P.

13 from .0445 to .0493 gms. per 100 cc., or .206-.227 grs. per fl. oz., or 90-99 per cent. min. U. S. P.

4 from .0395 to .0444 gms. per 100 cc., or .182-.205 grs. per fl. oz., or 80-89 per cent. min. U. S. P.

3 from .0345 to 0.394 gms. per 100 cc., or .159-.181 grs. per fl. oz., or 70-79 per cent. min. U. S. P.

The inspection showed paregoric to be in a very satisfactory condition, 19 samples equaling or exceeding U. S. P. strength, 13 being deficient by less than 10 per cent., and only 7 by more than 10 per cent. The weakest sample was only 70 per cent. minimum U. S. P. strength, while one was 131 per cent. U. S. P.; this latter sample appears to be dangerously strong.

Thirty-five samples were of the normal yellow-brown color. **26957**, the weakest of all, was light yellow in color; **27544** was brown and **27719** and **27722** were dark brown, the latter being labeled "Elixir Paregoric" and stated to contain licorice. In **27544** and **27719** the abnormality in color was not associated with a deficiency in morphin.

This much-used preparation ranged in price from 15 to 35 cents for four ounces of samples of equivalent strength.

Methods of Analysis.

Morphine. The method used was based on that suggested by Eaton (Bur. of Chem., Bull. *137*, p. 189), with, as seemed to us, some useful modifications. Evaporate 100 or 50 cc. of paregoric to about 15 cc. and transfer to separatory funnel. After washing out with ether as directed the sample was transferred to a 100 cc. flask, made up to the mark with lime water, shaken, and allowed to stand for one hour. 50 cc. of this filtered solution was introduced into a separatory funnel and shaken out three times with chloroform, 15 cc. each, and then with 25 cc. of washed ether. (Repeated tests of the ether wash gave a negative test with Mayer's reagent, showing washing once with ether was sufficient for paregoric.) Collect ether-chloroform extractions in another separatory funnel and wash with 10 cc. of limewater; return limewater to original solution and reject the immiscible solvent. To the solution now add 20 cc. of alcohol and then 10 cc. of one per cent. ammonium chloride solution to free the morphine, testing with wet litmus paper held in the neck of the funnel. Follow with 30 cc. of chloroform and shake thoroughly for several minutes. Draw off and shake with four successive 30 cc. portions of a mixture of one part alcohol and four chloroform. Filter the combined alcohol-chloroform extracts, after washing with 10 cc. of water, through a filter wet with chloroform into a 250 cc. pressure flask, removing the chloroform and alcohol by distillation under diminished pressure. (In this way all but about 10 cc. of the solvent may be recovered.) Evaporate the undistilled portion at room temperature in a bell jar using a current of filtered air. When dry add 5 cc. of absolute alcohol and allow to stand until complete solution is effected. Then dissolve in 5 cc. of fiftieth-normal sulphuric acid and titrate with fiftieth-normal potassium hydroxide, using cochineal as indicator.

SODIUM SALICYLATE.

(*Sodii Salicylas.*)

Sodium salicylate should contain not less than 99.5 per cent. of the pure salt. Its aqueous solution should be colorless and should have only a slightly acid reaction. It should be free from sulphates, sulphites, chlorides and heavy metals.

Thirteen samples were analyzed. These contained from 96.0 to 98.4 per cent. sodium salicylate. One gave a colorless aqueous solution, one pinkish and eleven a slight brown color. Eight gave slightly acid and five distinctly acid reactions. No sulphates were found in nine samples, traces in two, and considerable in two. No sulphites were found in five samples, traces in six, and considerable in two. No chlorides were found in ten samples, and traces in three. No heavy metals were found in four samples, and traces in nine.

No glaring adulteration was detected in any of the samples, although all samples were somewhat below full U. S. P. strength; in three samples the deficiency amounting to as much as four per cent.

The same tendency towards short-weight, so often observed in purchases from druggists, was shown with this drug. Although one ounce was asked for in every case, the amount delivered ranged from 0.8 to 1.2 oz., only three samples giving the full weight, and five showing a deficiency of 20 per cent.

The U. S. P. methods of analysis were used.

TABLE XXIX.—SODIUM SALICYLATE.

Station No.	Place of Sale.	Cost per oz.	Weight sold for 1 oz.	Sodium Salicylate	Color of Aqueous Solution.	Reaction.	Sulphates.	Sulphites.	Chlorides.	Heavy Metals.
		cts.	oz.							
27651	Danbury	10	0.8	98.4	sl. brown	sl. acid	No	No	No	Trace
27739	Hartford	10	0.9	96.0	sl. brown	dist. acid	Trace	Trace	Trace	No
27748	Hartford	10	0.8	97.6	sl. brown	dist. acid	Trace	Trace	No	No
27574	Meriden	10	0.8	97.6	colorless	dist. acid	No	No	No	Trace
27570	New Britain ...	10	0.9	98.4	sl. brown	sl. acid	No	Trace	No	Trace
27497	New Haven ...	10	0.9	97.6	sl. brown	sl. acid	No	No	No	Trace
27550	New Haven ...	10	1.2	98.4	sl. brown	sl. acid	No	No	Trace	Trace
27657	New London ..	10	1.1	98.4	sl. brown	sl. acid	No	Trace	No	Trace
27699	*Norwich	15	1.0	97.6	sl. brown	sl. acid	Yes	Yes	Trace	No
27587	Stamford	10	0.8	98.4	sl. brown	dist. acid	No	No	No	Trace
27787	Waterbury	15	0.9	96.0	pinkish	dist. acid	Yes	Yes	No	No
27789	Waterbury	10	0.8	96.0	sl. brown	sl. acid	No	Trace	No	Trace
27790	Waterbury	10	0.9	96.8	sl. brown	sl. acid	No	Trace	No	Trace
	Average	*10.8*	*0.9*	*97.5*	....	....	......	......	......	......

* Powers & Weightman, Philadelphia.

PRECIPITATED SULPHUR.

(*Sulphur Præcipitatum.*)

Precipitated sulphur is prepared by boiling sublimed sulphur and lime in water, then precipitating the sulphur from the clear solution by means of hydrochloric acid, and finally washing the precipitate with water until no further reaction for lime is given. This precipitate when dried contains the sulphur in a very finely divided state, rendering it more readily suspended in liquids and increasing its value in the making of ointments. The use of sulphuric acid is not admissible, as thereby the sparingly soluble calcium sulphate is formed instead of the easily soluble calcium chloride. The nature of the frequent adulteration of this material indicates either that sulphuric has been substituted for hydrochloric acid, that the precipitate has been insufficiently washed. or that there has been a direct addition of sulphate of lime to the finished product. It was rather surprising that when the station agent sought to buy precipitated sulphur, several of the druggists seemed unfamiliar with the existence of such a preparation.

U. S. P. precipitated sulphur should not leave a weighable residue on ignition, or on evaporating its ammoniacal solution. It should contain not less than 99.5 per cent. of pure sulphur and should have a neutral reaction.

Fifteen samples were analyzed. Although precipitated sulphur was asked for in each case, in three samples the labeling was simply "Sulphur."

TABLE XXX.—PRECIPITATED SULPHUR—PASSED.

Station No.	Place of Sale.	Weight.		Price of sample.	Residue on ignition.	Residue on evaporation of ammoniacal solution.	Reaction.	Lime (CaO).	Sulphuric anhydride (SO_3).
		Claimed.	Found.						
		oz.	oz.	cts.					
27502	Bridgeport.........	2	1.7	5	0.34	0.17	Neutral.	...	...
27735	Hartford	2	2.2	5	0.45	0.27	"	...	...
27736	* "	2	3.6	5	0.05	0.00	"	...	...
27573	Meriden.............	2	2.7	10	0.06	0.07	"	...	...
27571	New Britain.........	2	1.8	10	0.36	0.37	"	...	...
27496	New Haven..........	2	1.8	10	0.56	0.50	"	...	...
27663	* "	Box.	3.4	5	0.09	0.00	"	...	...
27683	New London........	2	1.9	5	0.07	0.00	"	...	...
27703	Norwich............	2	1.9	5	0.30	0.20	"	...	...
27782	*Waterbury.........	2	2.1	10	0.11	0.20	Acid.	...	...
27783	"	2	1.9	5	0.34	0.10	Neutral.	...	...
27784	"	2	1.9	10	0.32	0.30	"	...	...

* Labeled "Sulphur."

TABLE XXXI.—PRECIPITATED SULPHUR—ADULTERATED.

27737	Hartford............	2	1.9	5	46.46	2.07	Neutral.	19.09	27.16
27549	New Haven.........	2	1.9	10	3.47	1.77	"	0.96	1.93
27753	New Haven.........	2	2.0	5	46.19	1.73	"	18.94	26.89

All the samples showed some residue on ignition. In twelve of these this residue ranged from 0.05 to 0.56 per cent.; in the other three the residues were 3.47, 46.19 and 46.46 per cent. respectively. The residue from evaporating the ammoniacal solution in twelve samples ranged from none to 0.50 per cent.; in the three, showing large residues on ignition, 1.73, 1.77 and 2.07 per cent., respectively. In one sample the reaction was acid, in all the others neutral.

Three samples showed gross adulteration with sulphate of lime. These contained 19.09, 0.96 and 18.94 per cent. of lime and 27.16, 1.93 and 26.89 per cent. of sulphuric anhydride, respectively.

The usual variations in weight sold were shown by these samples. From 1.7 to 3.4 ozs. were delivered in response to a request for 2 ozs., at a cost ranging from 5 to 10 cents.

The three samples found to be adulterated were reported to the Dairy Commissioner and second samples were purchased by him. **6335** and **6337**, bought of H. Morris and Charles S. Leete, New Haven, contained 0.38 and 0.24 per cent. of ash, respectively, although the station's samples contained 3.47 and 46.19 per cent. the third sample, **6850**, from Goldfield Bros., Hartford, contained only 0.03 per cent. ash against 46.46 per cent. obtained in the first sample; this sample, however, was not precipitated sulphur, but ground brimstone.

The results secured with these three samples again illustrates the futility of the present method of buying three samples. The dealer is at once put on his guard, and the purchase often does not represent the same quality of material sold to the general consumer. In the case of one of these samples, after the sample was purchased and the dealer recognized the purpose of the purchase, he declared the sample was not U. S. P.

TURPENTINE.

At the 1911 session of the General Assembly an act (Chapter 274, Public Acts of 1911) concerning the adulteration of turpentine was passed. Section 1 of this act provides that

"No person, firm, or corporation shall manufacture, mix for sale, offer or expose for sale, or have in his or its possession with intent to sell, or sell, under the name of turpentine or spirits of turpentine, any article which is not wholly distilled from rosin, turpentine gum, or scrapings from pine trees, and unmixed and unadulterated with oil, benzine, or any other substance of any kind whatsoever, unless the package containing the same shall be stenciled or marked with letters not less than two inches high and one inch wide 'adulterated spirits of turpentine.' Nothing herein contained shall be construed as prohibiting the manufacture or sale of any such compound or imitation, provided the package containing the same shall be plainly marked as such."

Turpentine had never been systematically inspected in this State. Acting, therefore, under the authority of the above law, the Dairy Commissioner, through his agents, collected 130 samples, which were analyzed in this laboratory, and are herewith reported. The samples were taken chiefly from the stock of dealers in painters' supplies.

Turpentine as sold in this country is of two general varieties, that distilled from gum turpentine and that distilled from cut pine, fir or spruce, known as "wood" or "stump" turpentine. When properly refined the latter closely resembles gum turpentine. Objection has been raised to its use, however, because of its odor, its physiological effect, its lack of uniformity and unsatisfactory working qualities. It is believed, however, that improved manufacturing processes will in the near future render this product satisfactory commercially and thus utilize the vast stumpage waste in the South. In the present examination no attempt has been made to identify wood turpentine in distinction from that distilled from the gum.

American turpentine is frequently adulterated with cheaper, inferior oils, generally petroleum oils corresponding closely in specific gravity and temperature of distillation with turpentine. Certain coal-tar oils, rosin spirits and wood turpentine are also sometimes used as adulterants.

The Bureau of Chemistry, U. S. Dept. of Agriculture, has suggested specifications for three grades of commercial turpentine (Bull. *135*, p. 25) as follows:

Standard or No. 1, spec. grav. at 20° C. from 0.862-0.870; refractive index at 20° C. from 1.468 to 1.476; 95 per cent. should distill below 170° C.; on polymerization the residue should not exceed 1 per cent., should be reddish in color and viscous, and its refractive index at 20° C. should be from 1.500 to 1.520.

Second quality or No. 2, spec. grav. at 20° C. from 0.862-0.875; refractive index at 20° C. from 1.468 to 1.480; 90 per cent. should distill below 170° C.; the polymerization residue must not exceed 1 per cent. and must have a refractive index of not less that 1.500.

Third quality or No. 3, spec. grav. at 20° C. from 0.865-0.880; refractive index at 20° C. from 1.468 to 1.485; 60 per cent. should distill below 170° C.; the polymerization residue must not exceed 1 per cent. and must have a refractive index of not less than 1.500.

Coste gives similar specifications for pure turpentine, though varying slightly in some details (Analyst, *33*, 220).

Specific gravity at 15.5° C. from 0.860 to 0.871; refractive index at 20° C. from 1.469 to 1.472; should yield no distillate below 155° C., not less than 70 per cent. between 155° and 160° C., and not less than 95 per cent. up to 180° C.; no part of the distillate should refract below pinene, 1.4652.

Walker gives still other specifications, which likewise show minor variations from those first cited (Bur. of Chem., Bull. *109*, p. 14).

Specific gravity at 15.5° C. from 0.862 to 0.875; refractive index at 20° C. from 1.469 to 1.474; initial distillation about 156° C., 95 per cent. distilling over between 153.5° and 165.5° C. Six cc. of turpentine (by the method indicated) should show not less than 0.3 cc. unpolymerized oil after thirty minutes and not less than 0.5 cc. after eighteen hours.

In order to simplify the tables the refractive index is expressed in degrees of the butyro-refractometer, 63.2 and 76.0 corresponding to refractive indices of 1.468 and 1.476, respectively. The methods used require no special comment; the polymerization method employed was that given by Walker (Bur. of Chem., Bull. *109*, p. 14), the foam test was that quoted by many authorities, in which a persistence of foam after violent shaking indicates the presence of mineral oil, and the Klein potassium iodide test was likewise a test for mineral oil.

The results of analysis are shown in two tables, first (Table XXXII), those which gave specific gravities between 0.858 and 0.883 at 15.5° C., and refractive indices between 62.0° and 73.8°, which are passed as "not found adulterated," and second (Table XXXIII), those which were found to contain mineral oil or water, or were otherwise below standard.

Eighty-five samples were not found adulterated, although doubtless some of these were in part, if not wholly, wood turpentine. These ranged in color from water-white to yellowish. Nine of the samples gave the foam test, but further examination revealed the presence of no appreciable amount of mineral oil.

The specific gravity at 15.5° C. ranged from 0.858 to 0.883, corresponding to 0.861 to 0.886 at 20° C. The following groups may be formed, based on specific gravity:

17 samples between 0.858 and 0.867
54 samples between 0.868 and 0.872
11 samples between 0.873 and 0.877
3 samples between 0.878 and 0.883

In other words, based on this determination alone only 17 of the samples would meet the U. S. specifications for standard No. 1 turpentine, 71 those for second quality, 11 others those for third quality, while three others showed gravities higher than either of the three U. S. grades.

The refractive index ranged from 62.0° and 73.8°, eighty between 62.0° and 69.5°, and five between 70.0° and 73.8°. These values would satisfy the requirements of any of the three U. S. grades.

Twenty of the samples gave more or less pronounced reactions for mineral oil by the Klein test. The specific gravities and refractive indices of these samples, however, were so nearly normal that the amount of mineral oil present must have been extremely small, and these samples are passed as not found adulterated.

Twelve of the passed samples were subjected to fractional distillation, in some cases to secure data from samples apparently pure, and in others because of doubts of their purity raised by other tests. In these the initial distillation temperature ranged from 155° to 161°, from 57 to 98 per cent. distilled under 165°, and from 85 to 98 per cent. under 175°. With the exception of **6141**, which by all the tests appeared to be wood turpentine, the distillation data on these samples were considered reasonably satisfactory. The refractive indices of the different fractions were likewise normal.

Adulterated and Substandard Samples.

In Table XXIII are given the analyses of forty-five samples, which are adulterated or otherwise of inferior quality. Thirty-four of these contained mineral oil in large amounts. four contained water, one mineral oil and water, and six were otherwise below standard grade.

Many of the samples were water-white in color, while others were yellowish and those containing water had a milky appearance. In nine samples, which other tests proved to contain from

TABLE XXXII.—TURPENTINE

Station Number.	Sold as	Dealer.
6141	Turpentine	*New Milford:* C. M. Beach
6401	"	*South Norwalk:* C. E. Dowe
6402	"	Fox Cycle and Hardware Co.
6403	"	*Norwalk:* H. F. Prowitt
6404	"	Hubbell Staples
6406	"	*Meriden:* Wm. S. Bailey
6408	"	John F. Butler
6410	"	*Middletown:* C. A. Pelton
6411	"	Wm. Greaves
6416	"	*New Haven:* The F. E. Spencer Co.
6417	"	*Hartford:* Bonner Preston Co.
6419	"	Hoffman Wall Paper Co.
6420	"	Sisson Drug Co.
6421	"	American Wall Paper and Paint Co.
6422	"	Wadsworth Howland Co.
6424	"	C. H. Talcott & Co.
6425	"	C. R. Turner
6428	"	Sisson Drug Co.
6429	"	*Meriden:* Little, Somers & Hyatt Co.
6430	"	Grimord Bros.
6431	"	Birdsey & Raven
6432	"	*Wallingford:* The J. R. Burghoff Co.
6434	"	Dickerman Hardware and Supply Co.
6435	"	*New Britain:* The John Boyle Co.
6439	"	Morgan & Kingsley
6440	"	E. U. Thompson
6441	"	*Greenwich:* Jaynes Hardware Co.
6442	"	Greenwich Hardware Co.
6443	"	D. K. Allen
6444	"	*Stamford:* Warshow's Paint and W. P. Co.
6445	"	J. S. Davenport & Sons
6446	"	Lockwood & Palmer
6449	"	*Willimantic:* A. B. Holmes
6450	"	Latham & Crane
6451	"	*Rockville:* N. Wendheiser
6452	"	Geo. W. Hill
6453	"	*Danbury:* Danbury Hardware Co.
6456	"	R. R. Wildman
6460	"	*Winsted:* G. W. Kilmer
6462	"	J. F. Denison & Son
6463	"	*Torrington:* James Smith's Son
6464	"	J. F. Baldauf
6466	"	*Ansonia:* T. P. Terry & Son
6467	"	Estate Lockwood & Hotchkiss
6468	"	Frank Yudkin

NOT FOUND ADULTERATED.

Color and Appearance.	Foam Test.	Klein Potassium Iodide Test.	Specific gravity at 15.5° C.	Temperature of Initial Distillation. °C.	Percentage distilling.				Butyro-refractometer at 20° C.			
					Under 155° C.	155° to 165° C.	165° to 175° C.	175° to 180° C.	Original Material.	Fraction under 155° C.	Fraction 155° to 165° C.	Fraction 165° to 175° C.
Yellowish	Yes	No	.880	161	..	57	28	..	67.2	...	62.5	65.4
Colorless	No	"	.871	...	..	..	..	..	65.7	...	...	...
"	"	"	.871	157	..	92	6	..	67.0	...	65.0	69.9
"	"	"	.872	157	..	87	8[1]	..	66.1	...	64.0	68.1[1]
"	"	"	.871	158	..	98	..	..	66.1	...	65.7	...
Sl. yellow	"	"	.871	...	..	..	..	..	64.5	...	...	...
"	"	"	.870	...	..	..	..	..	65.1	...	...	...
Colorless	"	"	.874	...	..	..	..	..	67.3	...	...	...
White, sl. cloudy	Yes	"	.873	...	..	..	..	..	66.5	...	...	...
Colorless	No	"	.873	...	..	..	..	..	68.1	...	...	...
"	"	Faint pink	.870	...	..	..	..	..	66.1	...	...	...
"	"	Pink brown	.870	...	..	..	..	..	65.7	..	...	...
"	"	"	.872	...	..	..	..	..	68.0	...	...	...
Cloudy, yellowish	"	No	.870	...	..	..	..	..	66.1	...	...	...
Bluish	"	Pink brown	.871	...	..	..	..	..	67.0	...	...	...
Colorless	"	"	.872	...	..	..	..	..	67.0	...	...	...
Yellowish	Yes	No	.883	157	..	76	13[1]	..	70.2	...	64.3	68.1[1]
Colorless, sl. cloudy	No	"	.871	...	..	..	..	..	67.0	...	...	...
White, cloudy	"	"	.873	...	..	..	..	..	68.4	...	...	...
Yellowish, cloudy	"	Yellow	.865	...	..	..	..	..	63.7	...	...	...
Colorless	"	Pink brown	.871	...	..	..	..	..	67.0	...	...	...
"	"	"	.873	...	..	..	..	..	66.7	...	...	...
Yellowish, cloudy	"	Yellowish	.873	...	..	..	..	..	68.0	...	...	...
Colorless	"	Pink brown	.871	...	..	..	..	..	69.1	...	...	...
"	"	"	.872	...	..	..	..	..	65.3	...	...	...
White, cloudy	"	"	.871	...	..	..	..	..	66.1	...	...	...
Colorless	"	No	.872	...	..	..	..	..	68.0	...	...	...
Yellowish	"	"	.871	...	..	..	..	..	67.0	...	...	...
"	"	"	.870	...	..	..	..	..	73.8	...	...	...
Colorless	Slight	"	.870	...	..	..	..	..	66.1	...	...	...
Yellowish, cloudy	No	"	.872	...	..	..	..	..	67.0	...	...	...
Colorless	"	"	.871	...	..	..	..	..	67.3	...	...	...
"	"	Sl. pink	.871	...	..	..	..	..	67.0	...	...	...
"	"	No	.872	...	..	..	..	..	68.0	...	...	...
"	"	"	.863	157	..	68	20	..	61.1	...	60.9	62.0
"	"	"	.871	...	..	..	..	..	67.2	...	...	...
White, cloudy	"	"	.875	...	..	..	..	..	67.2	...	...	...
Yellowish	Slight	"	.872	...	..	..	..	..	65.9	...	...	...
Colorless	No	"	.863	...	..	..	..	..	65.0	...	...	...
Yellowish	"	"	.870	...	..	..	..	..	66.1	...	...	...
Yellowish, dirty	"	Yellowish	.870	...	..	..	..	..	66.1	...	...	...
White, cloudy	Yes	No	.867	...	..	..	..	..	64.0	...	...	...
Colorless	No	Faint yellow	.870	...	..	..	..	..	68.0	...	...	...
"	"	"	.870	...	..	..	..	..	67.0	...	...	...
"	"	No	.870	...	..	..	..	..	65.0	...	...	...

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[1] Fraction 165°–170° C.

TABLE XXXII.—TURPENTINE

Station No.	Sold as	Dealer.
6470	Turpentine	*Derby:* F. Hallock Co.
6471	"	Abbott & Co.
6472	"	Edw. Watkins
6473	"	*Shelton:* N. D. Clark
6474	"	*Naugatuck:* J. M. Page & Co.
6475	"	Geo. W. Benedict
6476	"	*Seymour:* Seymour Lumber and Hardware Co.
6478	"	*Bridgeport:* Hawley Hardware Co.
6481	"	Frank M. West
6483	"	Samuel Dawe
6484	"	James J. Conlin
6485	"	H. D. Murphy
6486	"	Somers Bros.
6487	"	Senior Bros.
6489	"	Harry Rider
6490	"	L. B. Silliman
6491	"	Hubbell & Wade Co.
6492	"	*Waterbury:* Apothecaries Hall Co.
6493	"	Austin & Woodruff Co.
6494	"	" " "
6496	"	Hotchkiss & Templeton
6497	"	Siglaski Marks Co.
6498	"	*Putnam:* Chandler & Morse
6500	"	Ballard & Clark
6501	"	H. S. Burt
6509	"	*Norwich:* The Eaton Chase Co.
6512	"	Fred C. Crowell
6513	"	T. H. Eldredge
6515	"	The Chas. Osgood Co.
6517	"	Lee & Osgood Co.
6518	"	*New London:* Lyon & Ewald
6519	"	Walter A. Smith & Co.
6522	"	The G. M. Williams Co.
6524	"	Darrow & Comstock
6525	"	New London Decorating Co.
6527	"	*New Haven:* Thompson & Belden
5528	"	Lightbourn & Pond Co.
6529	"	H. M. Hodges
6531	"	Wm. H. Sellwood
6532	"	John Foley

18 to 89 per cent. of mineral oil, the foam test gave negative results. Likewise in seven samples known to contain mineral oil, the Klein test failed to reveal it.

NOT FOUND ADULTERATED.—*Continued.*

Color and Appearance.	Foam Test.	Klein Potassium Iodide Test.	Specific gravity at 15.5° C.	Temperature of Initial Distillation. °C.	Percentage distilling.				Butyro-refractometer at 20° C.			
					Under 155° C.	155 to 165° C.	165° to 175° C.	175° to 180° C.	Original Material.	Fraction under 155° C.	Fraction 155° to 165 C.	Fraction 165° to 175° C.
Colorless	No	No	.871	...	..	..	..	..	68.0	...	...	...
"	"	Faint pink	.870	...	..	..	..	..	67.0	...	...	...
White, cloudy	"	No	.868	...	..	..	..	..	67.0	...	...	...
Colorless	"	Faint pink	.868	...	..	..	..	..	67.0	...	...	...
"	"	No	.869	...	..	..	..	..	68.0	...	...	...
Yellowish, fluorescent	"	Yellowish	.871	158	..	85	8[1]	..	68.0	...	64.8	68.1
"	"	"	.868	159	..	84	12	..	70.0	...	66.2	70.3
Colorless	"	No	.870	...	..	..	..	..	68.0	...	...	...
"	"	"	.868	...	..	..	..	..	67.0	...	...	...
"	"	"	.871	...	..	..	..	..	70.0	...	...	...
Yellowish, cloudy	"	Sl. pink	.870	...	..	..	..	..	68.0	...	...	...
Colorless	"	"	.868	...	..	..	..	..	66.4	...	...	...
White, cloudy	"	"	.869	...	..	..	..	..	67.5	...	...	...
"	"	No	.860	155	..	88	6[1]	..	62.0	...	58.8	61.7
Colorless	"	Sl. pink	.867	...	..	..	..	..	64.5	...	...	...
"	Yes	Red'sh brown	.864	...	..	..	..	..	65.0	...	...	...
Colorless, dirty	No	Sl. pink	.858	157	..	85	10[1]	..	62.0	...	58.8	61.8
Colorless	"	No	.868	...	..	..	..	..	68.1	...	...	...
White, cloudy	"	Sl. pink	.866	...	..	..	..	..	65.9	...	...	...
Colorless	"	No	.867	...	..	..	..	..	68.0	...	...	...
Colorless, dirty	"	"	.869	...	..	..	..	..	67.0	...	...	...
Colorless	"	"	.869	...	..	..	..	..	68.0	...	...	...
"	"	......	.873	...	..	..	..	..	69.8	...	...	...
"	"	......	.868	...	..	..	..	..	67.6	...	...	...
"	"	......	.867	...	..	..	..	..	67.0	...	...	...
"	"	......	.867	...	..	..	..	..	65.3	...	...	...
"	"	......	.867	...	..	..	..	..	66.0	...	...	...
Sl. color	Yes	......	.879	...	..	..	..	..	68.0	...	...	...
Colorless	No	......	.868	...	..	..	..	..	66.4	...	...	...
"	"	......	.872	...	..	..	..	..	65.0	...	...	...
Cloudy	"	......	.873	...	..	..	..	..	68.0	...	...	...
Colorless	"	......	.873	...	..	..	..	..	67.0	...	...	...
Sl. cloudy	"	......	.870	..	..	..	..	..	68.0	...	...	...
Colorless	"	......	.867	...	..	..	..	..	65.0	...	...	...
"	Slight	......	.873	...	..	..	..	..	68.0	...	...	...
"	No	......	.867	...	..	..	..	..	66.1	...	...	...
"	"	......	.869	...	..	..	..	..	66.6	...	...	...
Sl. cloudy	"	......	.863	155	..	79	16	..	63.2	...	62.0	68.5
Colorless	"	......	.872	...	..	..	..	..	67.0	...	...	...
"	"	......	.865	158	..	78	18	..	64.0	...	63.5	67.0

[1] Fraction 165°–170° C.

In the detection of mineral oil the chief dependence was placed on specific gravity, refractive index, initial distillation tempera-

TABLE XXXIII.—

Sample No.	Sold as	Dealer.	Color and Appearance.
6407	Turpentine	*Meriden:* The J. Lacourciere Co.	White, cloudy
6409	"	Ivers Bros.	"
6412	"	*Middletown:* L. O. & E. S. Davis	"
6415	Turpeen	*New Haven:* L. L. Rosenberg	Yellowish
6418	2d Run Turpentine	*Hartford:* H. Harris Co.	Colorless
6423	Turpentine	J. S. White Sons	Yellowish
6433	"	*Wallingford:* W. A. Butler	Colorless
6436	"	*New Britain:* Rackliffe Bros. Co.	White, cloudy
6437	"	W. Sanderson & Co.	Colorless
6438	Adult Turpentine	P. F. Kelley	"
6447	Turpentine	*Willimantic:* Hurley Grant Co.	"
6448	"	H. R. Chappell	"
6454	Commercial Turpentine	*Danbury:* Geo. F. Hawley	"
6455	Turpentine	F. A. Hull & Son	"
6457	"	F. C. Lawrence	Yellowish
6458	Turpeen	J. Wright & Co.	Colorless, dirty
6459	Turpentine	Fred Quaas	White, cloudy
6461	"	*Winsted:* Dickerman & Pond Co.	Yellowish, cloudy
6465	"	*Torrington:* Hotchkiss Bros. Co.	Colorless
6469	2d Run Turpentine	*Derby:* Louis Bennett	Yellowish
6477	Turpentine	*Seymour:* C. S. Lounsbury & Son	Colorless
6479	"	*Bridgeport:* Coester Bros.	"
6480	"	Geremia & Cocozza	White, cloudy
6482	"	Joseph Coughlin Co.	Colorless
6488	"	Edw. J. Brooks	"
6495	"	*Waterbury:* Wilson & Savin	Yellowish, cloudy
6499	"	*Putnam:* J. O. Fox & Co.	"
6502	"	*Danielson:* Woodward Drug Store	Colorless
6503	"	The Burrows Drug Co.	"
6504	"	*Moosup:* C. D. Salisbury	"
6505	Turpeen	W. W. Rood	Slightly cloudy
6506	Turpentine	*Plainfield:* Dearnley & Clark	Colorless
6507	"	*Norwich:* Preston Bros.	"
6508	Substitute Turpentine	Albert Boardman	"
6510	Turpentine	Peck, McWilliams & Co.	Yellow
6511	"	P. F. Murbagh	Colorless
6514	"	S. W. Carroll & Son	"
6516	"	H. Blackledge & Co.	"
6520	"	*New London:* H. E. Hanson	Slightly cloudy
6521	Adult. Turpentine	R. J. Sisk	Colorless
6523	Turpentine	Eaton & Wilson	"
6526	"	Hobson & Root	"
6530	"	*New Haven:* Wadsworth & Howland	"
6533	"	E. M. Walsh Co.	Slightly cloudy
6534	"	S. G. Grillo	Colorless

ADULTERATED TURPENTINE.

Foam Test.	Klein Potassium Iodide Test.	Specific gravity at 15.5° C.	Temperature of Initial Distillation °C.	Percentage distilling.				Butyro-refractometer at 20° C.					Unpolymerized Oil.		
				Under 155° C.	155° to 165° C.	165° to 175° C.	175° to 180° C.	Original material.	Fraction under 155° C.	Fraction 155° to 165° C.	Fraction 165° to 175° C.	Fraction 175° to 180° C.	Percentage.	Butyro-refractometer at 20° C.	Color.
No	No	.865	..	..	..	..	..	61.2	..	..	..	..	..	..	......
“	“	.865	..	..	..	..	..	62.3	..	..	..	..	..	..	......
“	“	.835	—142	45[2]	46	..	..	42.1	25.6	58.9	..	..	27	26.6	Colorless
Yes	Pinkish red	.822	150	23	27	18	..	29.0	17.1	20.6	26.1	..	88	24.5	“
“	“	.817	158	..	22	22	10	34.0	..	17.4	22.9	28.1	82	30.3	“
“	No	.857	—142	24	43	..	..	56.9	31.6	54.6		..	22	56.4	Pinkish
“	Pink	.799	145	34	24	16	..	25.6	15.9	20.5	25.9	..	91	22.9	Colorless
Yes	No	.856	154	9	50	22	..	57.1	37.2	52.8	58.3	..	..	..	......
No	“	.850	152	7	67	..	..	55.0	44.0	52.8	..	..	..	..	......
Yes	Red	.828	—142	6	11	12	..	35.0	10.6	13.6	21.1	..	92	35.0	Colorless
No	No	.847	—142	39	54	..	..	53.1	42.4	60.2	..	..	18	22.0	“
Yes	Pinkish red	.844	154	6	64	..	..	51.0	40.6	48.6	..	..	41	51.8	Pinkish
“	“	.815	145	26	34	..	..	34.0	22.9	29.9	..	..	..	..	......
Slight	No	.859	—142	25	56	..	..	57.1	37.2	57.9	..	..	16	60.3	Sl. pink
Yes	“	.856	—142	17	46	15[1]	..	59.7	37.7	56.0	63.2[1]	..	21	63.1	Colorless
“	Yellowish brown	.823	—142	11	16	40[1]	..	34.0	14.2	19.3	26.6[1]	..	82	30.1	“
Slight	No	.858	—142	16	39	18[1]	..	60.9	36.5	54.6	61.8[1]	..	25	63.0	Sl. pink
No	Slightly yellow	.865	155	..	68	17[1]	..	62.9	..	60.0	63.1[1]	..	17	67.3	“
Yes	Yellowish	.814	160	..	13	21[1]	31[3]	34.0	..	27.3	30.1	33.3	54	20.6	Colorless
“	Pinkish red	.828	150	4	14	18	..	38.7	18.8	20.9	26.7	..	78	36.8	“
No	No	.868	155	..	64	22	..	60.0	..	57.7	59.2	..	18	56.4	“
Slight	“	.847	155	..	77	12	..	56.0	..	51.1	57.4	..	38	66.8	Sl. pink
Yes	Slightly yellow	.831	155	..	18	15	9	39.7	..	19.8	27.9	33.2	77	37.0	Colorless
No	No	.856	150	14	34	29	..	60.0	38.1	53.1	60.2	..	26	56.3	Pink
Slight	Slightly pink	.841	152	8	65	14[1]	..	50.0	40.1	47.3	53.1	..	42	57.0	Sl. pink
Yes	Yellowish	.791	151	10	34	28	..	19.2	9.5	12.2	17.4	..	83	13.2	Colorless
No	....	.860	155	..	41	35	7	60.0	..	55.0	60.0	61.2	..	..	......
Yes	....	.852	155	..	37	34	8	55.4	..	50.0	55.3	57.0	..	..	......
Slight	....	.837	—153	8	67	8	6	47.0	38.2	45.4	48.0	48.5	44	49.0	Colorless
No	....	.857	155	..	59	25	4	58.0	..	55.4	59.0	59.0	..	..	......
Yes	....	.825	148	9	9	13	5	36.5	11.7	15.2	21.2	26.0	91	34.8	Colorless
No	....	.838	153	5	61	27	..	47.4	39.0	45.3	50.4	..	47	53.5	“
Yes	....	.833	155	..	17	24	8	42.5	..	30.0	36.3	40.7	66	38.8	“
“	....	.834	158	..	35	39	7	45.0	..	39.0	42.4	44.0	33	36.0	“
“	....	.873	142	8	21	23	9	59.0	28.0	42.2	50.0	54.4	46	56.0	Pinkish
“	....	.857	154	3	29	35	9	56.0	42.3	48.0	53.0	55.0	..	..	......
No	....	.810	146	20	21	19	7	31.7	16.2	20.8	26.4	31.0	89	30.1	Colorless
“	....	.843	—142	32[4]	59	7	..	53.3	27.4	60.4	71.0	..	26	63.2	Brownish
“	....	.856	156	..	56	28	..	57.0	..	54.0	57.8	..	..	..	......
Yes	....	.802	145	28	29	18	5	28.5	19.0	24.0	30.0	34.8	83	24.6	Colorless
“	....	.871	145	6	13	17	9	40.5	20.3	24.2	30.2	35.3	77	37.8	“
“	....	.826	155	..	17	17	9	38.0	..	20.0	26.4	31.0	81	36.0	“
No	....	.848	155	..	75	18	..	54.8	..	52.5	59.0	..	32	67.8	Brownish
“	....	.844	—142	42	54	..	..	53.0	32.5	60.0	..	..	28	59.0	“
Yes	.. ..	.821	150	7	13	17	9	33.0	11.2	16.3	23.0	28.0	88	32.8	Colorless

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[1] Fraction 165°–170° C. [2] 22% distilled under 145° C.

[3] Fraction 170°–180° C. [4] 21% distilled under 150° C., refractometer, 19.3.

ture, fractions distilling at different temperatures, the refractive indices of these fractions and the amount and appearance of the unpolymerized oil.

Samples Adulterated with Mineral Oil.

Specific gravity ranged from 0.791 to 0.873, thirty of the samples showing less than 0.858.

The temperature of initial distillation ranged from below 142° to 160°, nine distilling under 142° and thirty-one under 156°. The fractions distilling at the different temperatures were very variable, from none to 42 per cent. under 155°, from 17 to 96 per cent. under 165°, from 29 to 98 under 175°; in one sample 21 per cent. distilled under 150°.

The refractive index of the original turpentine ranged from 19.2° to 60.9°. The refractive indices of the different fractions increased with the temperature of distillation. The indices of the fractions under 155° ranged from 9.5° to 44.0°, 155°—165° from 12.2° to 60.4°, 165°—175° from 17.4° to 71.0°, 175°—180° from 26.0° to 55.0°.

Based on the amount of unpolymerized oil the percentage of mineral oil ranged from 16 to 92 per cent., fourteen containing over 75 per cent. The refractive index of the unpolymerized oil ranged from 13.2° to 67.8°. This oil was generally colorless or faint pink and had the characteristic odor of mineral oil.

Samples Adulterated with Water.

In these four samples the turpentine had a milky appearance; the specific gravity ranged from 0.856 to 0.865 and the refractive index from 57.1° to 62.3°.

Samples Below Standard.

In these six samples the specific gravity ranged from 0.847 to 0.868, the temperature of initial distillation from 155° to 156°, from 37 to 77 per cent. distilled under 165° and from 71 to 89 per cent. under 175°. The refractive index of the original turpentine ranged from 55.4° to 60.0° while that of the fractions ranged from 50.0° to 61.2°. In two of these samples there were indications of the presence of a certain amount of mineral oil, but the evidence was contradictory, and they are simply classed as substandard samples.

Summary.

Of 130 samples analyzed 85 were passed as not found adulterated. Seventeen of these meet the U. S. specifications for No. 1 turpentine, 71 those for No. 2, and 11 those for No. 3; three samples showed higher gravities than permitted for any of these three grades.

Forty-five samples were adulterated or below standard, 34 with mineral oil from 16 to 92 per cent., four with water, one with mineral oil and water, while six others were below standard.

Of the adulterated samples 36 were sold as turpentine, 3 as turpeen, 2 as second run turpentine, 2 as "adulterated" turpentine and one each as substitute and commercial turpentine. The samples of turpeen, second run and "adulterated" turpentine were somewhat similar in composition and contained from 78 to 92 per cent. of mineral oil.

The manufacturers and jobbers represented in the present inspection, as far as known, were as follows, the samples found not to be pure turpentine being indicated by heavy type:

American Naval Stores Co., New York, 6406, 6416, 6421, 6428, 6492; Apothecaries Hall Co., Waterbury, 6466, 6474, 6476; Barclay Naval Stores Co., 6408, 6419, 6424, 6442, 6444, **6459**, 6472, 6473, 6478; J. W. Barry, Boston, **6412**, 6417, **6423**, **6436**, **6447**, **6455**, 6509, **6516**, **6533**; Booth & Law, New Haven, **6409**, 6430, **6458**, 6460, 6468, 6532, **6534**; A. G. Belden & Co., New York, 6402, 6403, 6445; O. T. Bourne Co., Savannah, Ga., 6497; Brewer & Co., Worcester, Mass., 6500; Carolina Pine Products Co., Cleveland, O., **6510**; Carpenter & Morton Co., Boston, 6475, 6518; John A. Casey & Co., New York, 6401, 6404, 6425, 6432, 6434, 6441, 6446, 6449, 6453, 6471, 6481, 6483, 6494, 6496, 6501, 6519, 6522, **6523**, 6527, 6528; E. C. Church, Providence, R. I., **6504**; L. O. & E. S. Davis, Middletown, 6411; Devoe & Raynolds, New York, 6435; J. R. Ells, Southport, **6457**, **6465**; Gulf Turpentine Co., Cleveland, O., **6508**; H. S. Hawley, Danbury, 6456; H. M. Hodges & Bro., New Haven, **6433**; Hubbell & Wade Co., Bridgeport, 6487; Independent Turpentine Co., New York, 6443; Jackson Varnish Co., Chicago, **6438**; J. T. Kirk, New York, 6489; Longman & Martinez, 6141; Loos & Dilworth, Philadelphia, **6479**, **6488**, **6507**, 6512, 6513, 6515, 6517, **6521**, 6524, **6530**; Lee & Osgood Co., Norwich, **6448**, **6502**, **6503**; David B. Levy, New York, **6454**, **6526**; Chas. Osgood Co., Norwich, **6499**; Penn Alcohol and Chemical Co., Philadelphia, 6429, 6431, 6450; M. W. Sarendon, New York, 6490; Sherwin-Williams Co., Newark, N. J., 6525; Siglatski & Briggs, Hartford, **6437**, 6462; L. B. Silliman, Bridgeport, 6467, 6485; Sisson Drug Co., Hartford, 6439; Southern States Turp. Co., **6418**, **6469**, 6493, **6514**, **6520**; T. E. Spencer, 6531; Thompson & Belden, New Haven, 6440, 6451, 6463, 6464, **6477**, 6484; Tolar, Hart & Co., 6410, 6452; U. S. Turpentine Co., 6491; Weaver Co., Providence, R. I., **6480**, **6505**.

PROPRIETARY REMEDIES.

A number of these remedies were examined with sufficient completeness to make a fair judgment of their medicinal value and the claims made for them. It is well-known that, even when the claimed ingredients are present, as a rule the purchaser pays an exorbitant price for remedies of more or less well-known efficacy.

Hydrozone.

27511. *Hydrozone, 30 Vol.* H_2O_2, Charles Marchand, New York. This is simply a proprietary name for a preparation of hydrogen dioxide, supposed to be of unusual excellence and strength. The capacity of the bottle was 58 cc., but it contained only 13 cc. of the liquid. The cork was apparently tight, but the condition of the advertising matter surrounding the bottle indicated possible leakage. Hydrogen dioxide deteriorates rapidly unless handled and stored with the greatest care and it would be expected that with a solution as strong as this one claimed to be deterioration would be even more rapid. This sample contained only 0.68 per cent. of dioxide, less than one-fourth the strength of the ordinary U. S. P. Solution of Hydrogen Peroxide, in spite of its claim to be three times stronger. It is interesting to note that in 1909 this Station analyzed a sample of the regular hydrogen dioxide put out by this same firm, which contained only 0.63 per cent. (Report for 1909, pt. ii, 264).

In order to be entirely fair another sample of Hydrozone, **1455**, was purchased and analyzed. The contents of the bottle practically reached the mark noted by the manufacturer as indicating proper volume, and there was no indication of any leakage whatever. This new sample, however, contained only 2.99 per cent. of dioxide, that is, the strength of the ordinary U. S. P. solution. It is quite probable that Hydrozone, when it leaves the manufacturer's hands, is of the strength claimed. It is evident, however, at least in the two examples examined by us, that because of the liability of hydrogen dioxide to deteriorate, especially when in concentrated form, the purchaser of Hydrozone can have little assurance he is receiving the superior article he expects. Any medicinal preparation of the nature of Hydrozone, which, because of the casual method of purchase of proprietary medicines, may have been on the druggist's shelf for months or possibly longer, must necessarily be an uncertain purchase.

Gouraud Oriental Cream.

27536. *Oriental Cream or Magical Beautifier for the Skin and Complexion,* Ferd. T. Hopkins, successor to T. Felix Gouraud. Capacity of bottle, 8 fl. ozs.; cost, 98 cents.

Specific gravity at 15.5°, 1.0457; specific gravity of liquid portion, 0.99989; solids per 100 cc., 5.35 gms., all of which is mercurous chloride (calomel); no mercuric chloride (corrosive sublimate) present.

The preparation consisted of about 13 gms. of calomel suspended in 8 fl. ozs. (240 cc.) of water. The amount of calomel in the bottle of this substance can be bought at retail for about 6 cents., the remaining 92 cts. is the charge for a half-pint of water. Calomel, while generally used internally, is often used externally "as an efficient alterative and desiccant in venereal and other ulcers, herpetic eruptions, etc." (U. S. Dispensatory, 19th Ed., p. 626.)

Spiro Powder.

27557. *Spiro Powder,* Spiro Company, Niagara Falls, N. Y. "It will prevent and destroy the odors of perspiration on the body, feet and clothing, relieve eczema, chafing and prickly heat, ease sore feet and reduce inflammation." Weight of sample, 20 gms.; cost, 25 cents. A very fine, light, white powder, with a mild, agreeable odor of oil of roses.

It contained 99.55 per cent. of ash, and showed no further loss on heating at 100° C. Qualitative tests showed zinc to be the only metal present, and no mineral or organic acids; 99.96 per cent. of zinc oxide found. On distillation with steam a clear distillate was obtained with the odor of roses; phenol and thymol absent. On heating under a watch glass, cooled in ice water, a very minute sublimate appeared in fine, tree-like crystals, which were not identified; it did not respond to the general tests for phenols; boric acid absent.

The preparation appears to be essentially zinc oxide, with possibly a trace (not over 0.50 per cent.) of zinc carbonate, and an odoriferous material similar to oil of roses.

Zinc oxide is sometimes employed "as an exsiccant to excoriated surfaces and in various skin diseases, sometimes by sprinkling on the affected part, but generally in the form of ointment. . . . As a cosmetic it has the great advantage over the preparations of lead of not being poisonous." (U. S. Dispensatory, 19th Ed., p. 1355.) Chemically pure zinc oxide may be bought for 35 cents per pound, while the commercial oxide costs but 15 cents per pound; the amount of zinc oxide in this preparation could be bought in the purest form for 1.5 cents.

Poslam.

26946. *Poslam,* Emergency Laboratories, New York. "The new discovery for Eczema and all other skin troubles." The sample was sold in a small tin and weighed 20.5 gms., and cost 50 cents. A grayish ointment with a strong, tarry odor.

31.84 per cent. was insoluble in chloroform, and contained salicylic acid, 11.47 per cent. of zinc oxide, and 19.45 per cent. of anhydrous corn starch. Another portion of the chloroform-insoluble residue yielded a small amount of salicylic acid. The aqueous extract from the shake-out gave a test for zinc, indicating that probably some zinc salicylate had been formed by the action of the zinc oxide and salicylic acid.

The chloroform-soluble portion of the ointment on evaporation showed bright yellow crystals, like sulphur. Sulphur determined by the method of Puckner and Hilpert (Rept. of Chem. Lab., Amer. Med. Asso., *2*, p. 26) amounted to 6.55 per cent.

The fatty portion, after removal of the tar oil, on distillation with steam gave a distillate having a slight odor of menthol; the aqueous liquid remaining in the distillation flask responded to tests for salicylic acid.

On extracting a portion of the chloroform extract with 95 per cent. alcohol, a residue of 14.40 per cent. was obtained; this was of a dark brown color and had a tarry odor. The fatty portion, after extracting the tar oil, was not identified, but was probably petrolatum. (See Puckner and Hilpert, *loc. cit.*)

A summary of the analysis follows:

Zinc oxide	11.47
Sulphur	6.55
Starch, anhydrous	19.45
Tar oil	14.40
Menthol	present
Salicylic acid	present

Fatty base, probably petrolatum, sufficient to make 100 parts.

The analysis shows that the preparation derives its therapeutic value from zinc oxide, tar oil, and sulphur. "These have long been used and known as more or less effectual remedies for the treatment of skin affections, but certainly do not warrant such claims as are made in the advertising matter sent out with Poslam stating it to be 'The newest medical discovery for the treatment of eczema, and all other skin affections' and ' . . . entirely different from anything yet used.'" (Puckner and Hilpert, *loc. cit.*) Even the larger sized jars put out by the company, holding 5.5 ozs. and costing $2.00, would cost the purchaser about $5.80 per pound, for materials not worth more than 17 cents at retail prices.

Dr. Franck's Grains of Health.

26947. *Genuine Doctor Franck's Grains of Health, Laxative Pills,* A. Rougureff, Paris, France. Number of pills, 49; weight, 5.33 gms.; cost, 39 cents. The pills were packed in a small box with shreds of cork, and were coated with a silvery substance.

1.78 per cent. ash was found, which showed qualitatively the presence of silver, sodium and iron, 0.91 per cent. of metallic silver being obtained. 12.29 per cent. of the pills was insoluble in 95 per cent. alcohol. The alcohol-soluble portion, on evaporation to dryness, gave a bright, shiny brown mass, yellow in thin layers, and tasting strongly of aloes. On dissolving in hot water and treating with a strong solution of sodium borate, a very pronounced greenish fluorescence appeared, indicating aloes in large amount; no alkaloids were detected. 25.90 per cent. of the pills was insoluble in water. Neither salicylic acid, benzoic acid nor phenolphthalein was present.

The pills appear to be essentially aloes coated with silver, and cost at the rate of $33.19 per pound.

Dr. Williams' Pink Pills for Pale People.

26954. *Dr. Williams' Pink Pills for Pale People,* The Dr. Williams Medicine Co., Schenectady, N. Y., and Brockville, Ont. "Safe and Effective Tonic for the Blood and Nerves. For Anæmia, Diseases due to Impoverished Blood, such as Rheumatism, Diseases of Women, Nervous Disorders resulting from Mal-Nutrition, including Neuralgia, Sciatica, St. Vitus' Dance. Useful in Locomotor Ataxia and Partial Paralysis. A digestive tonic for Dyspepsia and Chronic Constipation." The package contained 38 pills, weighing 12.75 gms., and costing 43 cents. The pink color of the pills was due to cochineal; the pill coating, consisting of sugar and calcium carbonate, made up 55 per cent. of the weight of the pill.

34.20 per cent. of the whole pills was insoluble in water; this residue dissolved in hydrochloric acid with effervescence (carbonates), a flocculent precipitate separating out. The aqueous solution gave a negative test for aloes, and contained no soluble iron, and no nitrates or phosphates; sulphates were present and a trace of chlorides. Iron was present in the hydrochloric acid solution. 22.19 per cent. of ash was found, showing much iron, lime, magnesium, carbonates and sulphates, and consisted chiefly of iron oxide, magnesium sulphate and calcium carbonate. 6.94 per cent. of iron oxide, 3.36 per cent. of sulphuric anhydride and 1.68 per cent. of magnesium oxide were found.

Phenolphthalein, benzoic acid and salicylic acid were not present. 97.81 per cent. of the pill mass was insoluble in 95 per cent. alcohol. The residue from the small soluble portion gave a negative reaction for aloes, and after proper treatment yielded a slight residue, which gave a very faint cloudiness with Mayer's reagent (trace of alkaloids), insufficient for identification.

A summary of the analysis follows:

Ash	22.19
Iron oxide	6.94
Sulphuric anhydride	3.36
Magnesium oxide	1.68
Insoluble in water	34.20
Pill mass insoluble in alcohol	97.81
Lime and carbonates	present
Alkaloids and chlorides	faint traces
Color	cochineal
Salicylic acid, benzoic acid, phenolphthalein and aloes	none

The active ingredients detected were iron oxide, and magnesium sulphate (Epsom salt), and a faint trace of alkaloids.

In spite of the claim that the pills are "Not a cure-all," we find that they are recommended for all diseases resulting from impoverished blood, a long list of female complaints, for many nervous disorders, such as St. Vitus' dance, paralysis and locomotor ataxia, and for male disorders arising from excesses, etc.; surely a rather wide field. In using the pills the patient is directed first to purge the bowels, then take the pills, bathe frequently, keep the bowels regular, and partake of a nutritious diet. The thought occurs that perhaps the desired result might as well be secured by following all of this treatment except the taking of the pills.

Kargon Compound.

27537. *Kargon Compound,* Kargon Extracting Co., Cincinnati, O. "Contains 15 per cent. alcohol." Volume of bottle, 31 cc.; cost, 39 cents. A rather heavy liquid, specific gravity at 15.5° C., 1.1644, of a brown color and a strong odor and tasting of buchu.

It contained 10.2 per cent. of alcohol by weight, or 15 per cent. by volume, and 18.1 per cent. of glycerine; total solids, 48.3 per cent.; ash 12.67 per cent., which gave qualitative tests for potassium and carbonates only. Five cc. of the substance distilled with phosphoric acid gave 0.6360 gm. of acetic acid, or 10.93 per cent. acetic acid, equivalent to 17.87 per cent. potassium acetate. (The 12.67 per cent. of potassium carbonate obtained in the ash was equivalent to 17.99 per cent. of potassium acetate.)

The analysis may be summarized as follows:

Specific gravity at 15.5° C.	1.1644
Alcohol by volume	15.0
Glycerine	18.1
Solids	48.3
Potassium acetate	17.87
Buchu	present

In other words, this remedy contains potassium acetate, glycerine, alcohol and buchu.

Kargon is one of those preparations whose advertisements often appear in our newspapers as solid reading matter, in which a harmless-looking prescription is given, consisting of Kargon Compound, Fluidextract of Dandelion and Compound Syrup of Sarsaparilla, with the ingenuous advice that they "can be procured from any good pharmacist and mixed at home." This prescription is evidently intended to lead the public to believe that Kargon is one of the numerous standard diuretics, but when one goes to buy it he finds that it is made by one and only one concern, a proprietary medicine in every sense of the word. Such a prescription as that given above of course yields an active diuretic. "But it is a combination that in the majority of cases of kidney disease will do great harm. And no matter what the condition, if used indiscriminately and 'taken regularly,' as the advertisements advocate, it cannot be otherwise than dangerous." (Jour. Amer. Med. Asso., Mch. 16, 1907, p. 967.)

"As an act of humanity kindly recommend this valuable mixture to your suffering relatives, friends or acquaintances, especially elderly people who may need this remedy," is advice which comes with each bottle, and which should be disregarded by every one having the slightest humanitarian instincts.

Schenck's Pulmonic Syrup.

27509. *Schenck's Pulmonic Syrup,* Dr. J. H. Schenck & Son, Philadelphia. "The 70 year old Standard Remedy for Consumption, Coughs, Colds, Diseases of the Lungs and Respiratory Organs." Volume of bottle, 11 fl. ozs., cost, 85 cents. A brown, syrupy fluid with a very sweet taste, and an odor of wintergreen and of an acetous character resembling vinegar.

Specific gravity at 15.5°, 1.3861. It was miscible with water without causing any precipitate. It had an acid reaction; lead acetate produced only a very slight turbidity in a 13 per cent. solution. On dilution with 95 per cent. alcohol a slight turbidity resulted. No alkaloids were present, and only 0.08 per cent. of ash. By treatment with Fehling's solution, 34.49 per cent. sucrose and 38.40 per cent. invert sugar, or 72.89 per cent. total sugars were obtained. The direct polarization at 24° C. was +26.4, after inversion —22.0.

Two gms. mixed with sand and dried to constant weight gave 75.59 per cent. solids.

Steam distillation gave a slight acid distillate with the odor of oil of wintergreen. The syrup shaken out with chloroform, after acidification, gave an oily residue of a wintergreen odor, with a reaction for salicylic acid, probably resulting from decomposition of oil of wintergreen.

The following is a summary of our analysis:

Specific gravity at 15.5°	1.3861
Alcohol	none
Glycerine	none
Solids	75.59
Sucrose	34.49
Invert Sugar	38.40
Ash	0.08
Oil of Wintergreen	present
Alkaloids	none

This remarkable remedy for consumption is essentially a wintergreen-flavored mixture of saccharine syrups, 96.4 per cent. of the solids consisting of sugars. It is hard to believe that the virtues of this material rests in the 2.7 per cent. of undetermined solids (possibly vinegar of squills). It is recognized that a rich and nutritious diet is essential in the treatment of consumption, and it is true that this substance with nearly 73 per cent. of sugar is highly nutritious, and yet one can scarcely recommend the purchase of such a preparation at the rate of $2.50 per quart, when molasses is obtainable at 50 to 60 cents per gallon.

Thialion.

27510. *Thialion,* a Non Effervescing Lithiated Laxative Salt, manufactured for The Voss Chemical Co., Danbury, Conn. Net weight, 4 ozs.; cost, 89 cents. A granular, gritty substance of a slightly brown color and with a salty taste; the addition of water caused no effervescence. Qualitative tests gave reactions for sulphates, chlorides, citrates, sodium and lithium.

The following determinations were made: chlorine, 1.94 per cent.; sulphuric anhydride, 15.51 per cent.; citric acid radical, 42.86 per cent.; lithium, 0.148 per cent., and total sodium, 25.84 per cent. Calculating the lithium as lithium citrate, the sulphate as sodium sulphate, the chlorine as sodium chloride, and the residual citric acid as sodium citrate we obtain the following probable composition of this material. (On heating at 100° C., a loss of only 0.28 per cent. was obtained; such water as the substance may contain exists therefore as water of crystallization, and this is estimated by difference.)

Sodium citrate	57.77
Sodium sulphate, anhydrous	27.53
Sodium chloride	3.20
Lithium citrate, anhydrous	1.48
Combined water (by difference)	10.02

In the literature sent to physicians and in its advertisements Thialion is stated to be "a laxative salt of lithia" of the following formula: "3 Li_2O, NaO, So_3, 7 HO," and sodio-trilithic anhydrosulphate is given as its name. As our analysis shows, it is simply a mixture of sodium citrate and sodium sulphate with very small amounts of lithium citrate and sodium chloride. The advertising literature, therefore, deliberately misrepresents the facts, for we have here no new chemical compound that possesses any mysterious therapeutic properties different from those of its component drugs. Speaking of the graphic formula furnished by the makers of this preparation the Journal of the American Medical Association says, Nov. 3, 1906, p. 1500: "To a physician who possesses but little knowledge of chemistry, it will seem impressive, and he may absorb the idea that it stands for a preparation that is the result of exhaustive scientific research. To the chemist, this formula will appear as a jumble of symbols and numbers that mean nothing. It is not worth while to call attention to the simplicity of this simple mixture of ordinary salts, for it is too self-evident."

Ely's Liquid Cream Balm.

26945. *Ely's Liquid Cream Balm,* "Remedy for Catarrh, Catarrhal Deafness, Hay Fever, Cold in Head." Ely Brothers, New York. Volume of bottle, 50 cc.; cost (including glass inhaler), 69 cents. A pinkish liquid of a rather thick consistency, with the odor of thymol and menthol.

Specific gravity at 15.5° C., 0.8696; no alcohol, no glycerine, no ash, no cocaine or other alkaloids present. Five gms. of the liquid showed 4.1215 gms. of unsaponifiable residue, and 0.6435 gm. of fatty acids or allied substances, a total of 4.7650 gms., or 95.3 per cent. (The above separation was probably accompanied by some mechanical loss in purifying the two fractions.) The unsaponifiable residue had a decided odor of menthol. Ten cc. of the liquid treated with glacial acetic, sulphuric and nitric acids gave a green color, indicating presence of thymol. The colorless, oily layer left after removing thymol was insoluble in water and cold alcohol, but soluble in ether, petroleum ether, and chloroform; this residue had a specific gravity of 0.860, index of refraction at 20°, 1.4715; treatment with acetic anhydride (Lewkowitsch, *i*, p. 376) showed the presence of mixed hydrocarbons. All these properties indicated liquid petrolatum as the basic substance. The fatty acids had a refractive index at 20° of 1.4689, but were not identified; these may have been due to an admixture of fixed oils or to impurities in the petrolatum. The polarization in alcoholic solution was lævorotatory, a characteristic of menthol.

This preparation appears to consist essentially of liquid petrolatum with small quantities of thymol and menthol.

"Liquid petrolatum is much used as a soothing local application in inflammation of the mucous membrane in the nose, throat, larynx, and even bronchial tubes. It is usually applied by means of an atomizer." (U. S. Dispensatory, 19th Ed., p. 925.) The amount of this simple and well-known remedy, contained in a bottle of this preparation (50 cc.) is worth about one-half of a cent.

Cubanos.

27558. *Cubanos, a Positive Relief for Asthma and Catarrh.* Manufactured for Cubanos Cure Co., New York. "Contains the following ingredients, Poppy Heads, Sugars, Stramonium, Leaves of Belladonna, Root of Belladonna, Tincture of Benzoin, Nitrate of Potash, and Opium (one-tenth grain to one ounce of Cubanos)." Packages of two sizes bought, the 10 cent size weighing 11.82 gms., the 25 cent size, 31 gms.

A microscopical examination showed the presence of belladonna leaves tissues (wavy parenchyma of upper and lower epidermis, stomata, glandular hairs, collenchyma cells, and calcium oxalate "sand"); belladonna root and poppy head tissues (pitted cells of inner epidermis of fruit coat) also present. Stramonium tissues strongly resemble those of belladonna, making it difficult to distinguish them.

The material contained 22.02 per cent. of ash, 1.86 per cent. being insoluble in hydrochloric acid (sand). Qualitative tests in the ash showed the presence of carbonates, sulphates, phosphates, chlorides, nitrates, silicates, iron, aluminum, calcium, sodium and potassium, most of which, excepting the nitrates, silicates and part of the potash, were probably normal ingredients of the vegetable substances of the mixture. 2.50 per cent. of nitrate nitrogen was present, equivalent to 18.02 per cent. of potassium nitrate. Reducing sugars were present.

Ten grams of the material yielded .0285 gm. of crude alkaloidal residue, which on purification amounted to .0160 gm., or 0.16 per cent. Mayer's reagent gave a heavy precipitate; general reactions for opium bases were obtained as follows:—nitric acid gave a reddish yellow color, potassium ferricyanide and ferric chloride and trace of hydrochloric acid gave a blue color. No attempt was made to detect hyoscyamine and atropine in the small alkaloidal residue. No benzoin was detected.

The material appears to be essentially as claimed, but is somewhat expensive, the smaller packages costing at the rate of $3.84 per lb., the larger, $3.65 per lb.

Dr. Pierce's Golden Medical Discovery.

26939. *Dr. Pierce's Alterative Extract or Golden Medical Discovery.* World's Dispensary Medical Association, Buffalo, N. Y. Capacity of bottle, 10 fl. ozs.; cost, 79 cents. Claimed to contain Golden Seal Root, Queen's Root, Stone Root, Black Cherrybark, Bloodroot, Mandrake Root, chemically pure Glycerine, pure Water and a very small amount of Borate of Soda, "less than a grain to the dose of 'Discovery.'"

The following determinations were made:—specific gravity at 15.5° C., 1.1070; alcohol, none, glycerine, 27.60 per cent.; solids, 38.80 per cent.; ash, 0.69 per cent.; sodium borate, 0.65 per cent.; polarization at 23° C., zero before and after inversion; phenolphthalein, none; potassium iodide, none.

While it was impossible to determine the presence of the various alterative vegetable drugs claimed in this preparation, the total amount of vegetable extractives found was 11.20 per cent., hardly entitling it to be called "a very concentrated, vegetable extract." The amount of sodium borate found was well within that claimed. The constituent drugs claimed to be present have a recognized therapeutic value, but hardly entitle it to the "cure-all" properties claimed for it in its advertising literature. That these well-known drugs by a mysterious combination, the result of "a tedious course of study and experiment, extending over several years," can become a "superior remedy" for coughs, bronchitis, laryngitis, weak lungs, sore throat, biliousness, dyspepsia, general debility, nervous prostration, blood diseases, skin diseases, catarrhal affections of all organs, heart diseases, malaria, constipation, kidney and bladder affections, etc., etc., is certainly a strain on one's credulity.

Peruna.

26944. *Peruna Tonic,* The Peruna Co., Columbus, O. "Contains eighteen per cent. of alcohol by volume." Capacity of bottle, 20 ozs.; cost, 75 cents. The main label on the bottle claims "Pe-Ru-Na contains cubebs, hydrastis canadensis, corydalis formosa, collinsonia canadensis, cedron seed, ginger, senna, glycerine and a very small proportion of the oil of copaiba." On a separate sticker is this naïve information:

"For a number of years requests have come to me from a multitude of grateful friends, urging that Peruna be given a slight laxative quality. I have been experimenting with a laxative addition for quite a length of time, and now feel gratified to announce to the friends of Peruna that I have incorporated such a quality in the medicine which, in my opinion, can only enhance its well-known beneficial character. S. B. Hartman, M.D."

A brown liquid, specific gravity at 15.5° C., 0.9870; alcohol by weight, 14.0 per cent., by volume, 17.37 per cent.; solids, 2.67, glycerine, 1.50, ash, 0.11 per cent; polarization direct and after inversion at 23°, ±0.0; phenolphthalein not present nor any inorganic laxative; positive tests for cubebs and senna.

The dealcoholized solution acidified and shaken out with ether and ether-acetone, then made alkaline with ammonia and shaken out with ether-chloroform gave a residue yielding a positive test with Mayer's reagent. Further tests in this residue gave results resembling those for prohibited alkaloids but it was found that these tests were due to senna and cubebs (declared on the label and otherwise identified). The only reaction not accounted for by the presence of these two vegetable drugs was the faint reddish color obtained with nitric acid, but this test is insufficient in itself to prove the presence of morphine or its derivatives. The principles of senna and cubebs are largely removed by shaking out with ether-acetone from acid solution, but it was shown that this separation is incomplete, some of these principles appearing in the residue from the alkaline shake-out.

Analyses of Peruna, made before the passage of the Federal law, show from 22 to 26 per cent. alcohol by volume, and from 0.35 to 0.44 per cent. of solids. It was so clearly an alcoholic beverage and not a medicine that the Internal Revenue Commissioner required sellers of it to take out a liquor license, which explains the sticker quoted above. The "grateful friends" requesting the addition of a laxative were probably dealers who objected to paying a liquor tax, and the "laxative addition" with which Dr. Hartman experimented "for quite a length of time," as far as we can determine, is simply the well-known drug senna. The extract from vegetable drugs in Peruna is only about one per cent.

A. D. S. Rheumatic Remedy.

26948. *A. D. S. Rheumatic Remedy,* Premium Remedy for the relief of Rheumatism, Lumbago, Sciatica and Gout. "Contains 4 per cent. alcohol." American Druggists' Syndicate, New York, Distributors. Capacity of bottle, 2.3 ozs.; cost, 50 cents.

A brownish viscid liquid, specific gravity at 15.5°, 1.1015; alcohol by weight, 4.1 per cent., by volume, 5.7 per cent.; solids, 23.4 per cent.; glycerine, 9.80 per cent.; ash, 7.90 per cent. Qualitative tests in the ash showed carbonates, sodium, potassium, iodides and a trace of sulphates. 6.45 per cent. potassium iodide, 1.25 per cent. sodium oxide and 5.29 per cent. salicylic acid were found, the two latter being equivalent to 6.13 per cent. sodium salicylate (calculated from the salicylic acid determination). No phenolphthalein present. An acidified portion dealcoholized and shaken out with ether and ether-acetone, gave a negative test for senna; made alkaline with ammonia and shaken out with ether-chloroform a residue was obtained giving a positive test for alkaloids with Mayer's reagent. This residue gave a faintly reddish color with nitric acid, a blue color with ferric chloride and ferricyanide, and no violet color with sulphuric acid and formaldehyde. The blue color with ferricyanide is given by many vegetable extractives, e. g., colchicum, and the third test is negative for opium bases. The nitric acid test is not conclusive enough for the identification of morphine or its derivatives.

A summary of the analysis follows:

Specific gravity at 15.5° C.	1.1015
Alcohol by volume	5.70
Solids	23.40
Glycerine	9.80
Ash	7.90
Potassium iodide	6.45
Sodium salicylate	6.13
Alkaloids	trace
Phenolphthalein	absent

The preparation, therefore, consists of potassium iodide and sodium salicylate (both well-known specifics for rheumatism) and an alcohol-glycerine infusion of a small amount of an unidentified vegetable drug, to which the trace of alkaloids found may be due.

The familiar legend "This is not a patent medicine, etc.," found on all A. D. S. preparations, has already been discussed under Syrup of Figs, page 156.

Rheumatogen.

27532. *Rheumatogen,* alcohol 20 per cent., Rheumatogen Chemical Co., New Haven. "The latest and most scientifically compounded preparation for the treatment of rheumatism in all its manifestations. It is especially adapted for Rheumatic Joints, Gout, Lumbago, Sciatica, and all ailments arising from kidney and bladder trouble. For Relief of Pain of Nervous Origin no Better Remedy is Known." Capacity of bottle, 4 ozs.; cost, 50 cents.

A brown liquid, specific gravity at 15.5° C., 1.0309; alcohol by weight, 13.3 per cent., by volume, 17.2 per cent.; solids, 12.70 per cent.; glycerine, 0.80 per cent.; ash, containing carbonates, sodium and small amount of sulphates, 3.95 per cent.; sodium salicylate, 10.93 per cent.; phenolphthalein and iodides, none; senna, present.

A positive test for alkaloids was secured with Mayer's reagent; further tests gave results similar to those noted under the preceding sample, and were not sufficiently conclusive for the identification of morphine or its derivatives.

A summary of the analysis follows:

Specific gravity at 15.5° C.	1.0309
Alcohol by volume	17.20
Solids	12.70

Glycerine	0.80
Ash	3.95
Sodium salicylate	10.93
Alkaloids	trace
Senna	present
Iodides and phenolphthalein	absent

The preparation appears to be simply a mixture of sodium salicylate and an alcoholic infusion of vegetable drugs, chiefly senna, to which the trace of alkaloids found may be due. Sodium salicylate is a specific for rheumatism and senna is a well-known laxative. The sodium salicylate present (the drug to which the preparation owes its value in the treatment of rheumatism) is worth about 1.25 cents.

Sanatogen.

26941. *Sanatogen,* the Food Tonic. Bauer & Co., Berlin. "Net weight, 200 gms." Net weight found, 199.5 gms.; cost, $1.90. "A definite, organic combination of 95 per cent. of pure, especially prepared Casein and 5 per cent. of Sodium Glycero-Phosphate." Whether or not this preparation is an organic "combination" we cannot say, but our analysis substantially satisfies the above claim as to the ingredients present. We have made a very careful and detailed analysis of this product in the effort to prove the nature of the protein and phosphorus compound or compounds present. The details of this analysis, and the methods used will be published elsewhere. Below will be found a summary:

Water	9.97
Total nitrogen	12.81
Nitrogen precipitated by acetic acid	12.54
Equivalent to casein	80.01
Ether extract	0.11
Ash	5.59
Sulphur	0.73
Sulphur due to casein	0.64
Phosphorus	1.49
Phosphorus in inorganic form	0.11
Phosphorus due to casein	0.69

The material is a mixture of casein and sodium glycerophosphate, with a small amount of unidentified protein, equivalent to 0.23 per cent. nitrogen, containing both phosphorus and sulphur, and a small amount of phosphorus, 0.11 per cent., in inorganic combination. The manufacturer's claims as to its composition are therefore substantiated, but many of the statements as to its food value made in its various advertisements will not stand close scrutiny, and savor strongly in certain instances of the typical proprietary medicine advertisement. The following are a few quotations of this nature:

> "In Sanatogen, by an intricate process of manufacture, casein and sodium glycerophosphate are united so intimately as to form a new and distinctive compound which is absorbed and assimilated with extraordinary facility."—*Sanatogen circular.*
>
> "Sanatogen the Food Tonic will once more make you a cheerful partner with good health. It will furnish materials for your life-force to grasp, absorb and build on."—*Boston Transcript,* June 4, 1910.
>
> "The Wan and Despondent Neurasthenic, who responds so poorly to the routine treatment of functional nervous disorder, will 'take on the native hue of resolution,' under Sanatogen."—*Amer. Jour. Clin. Med.,* March, 1911.
>
> "It effects nutrition directly by arousing metabolic activity. . . . It causes gain in flesh, strength and vigor of brain and body."—*N. Y. Med. Jour.,* Dec. 30, 1911.
>
> ". . . . Sanatogen supplies this deficiency [of nervous energy]—renews the strength—vigor and vitality—restores the depleted nerves and worn tissues to their normal health."—*The Literary Digest,* Nov. 12, 1910.
>
> "Sanatogen is science's logical answer to the call of the nerves, the *food* answer to the hungry cry of impoverished conditions, however these conditions may have been brought about, by fret, illness, stress of work, domestic, business or social exactions—with distressing results in sleep, in appetite, in 'blues,' in outlook on life."—*The World's Work,* Dec., 1911.
>
> "Sanatogen is four times as easily digested as wheat flour. Sanatogen possesses splendid tonic and vitalizing properties that place it high above any ordinary food-stuff of whatever kind."—*Chicago Record-Herald,* Nov. 28, 1911.
>
> "Patients in a very low condition of health have been sustained for prolonged periods upon Sanatogen alone; this proves it to be a life sustaining agent in itself."—*Sanotogen circular.*

In opposition to these sweeping claims we call attention to excerpts from the Journal of the American Medical Association, quoted in the North Dakota Food Department Special Bulletin, *2* (6), p. 107:

> "Only the highest class magazines and newspapers have been patronized; the 'copy' has been so written as to appeal not to the ignorant but to the intelligent. . . . . Truly, a wonderful preparation if these state-

ments are true; but they are false, most of them at least, and, in that many who can ill afford it may be led to pay a ruinous high price for a very ordinary food, the statements are viciously and cruelly false."

"Dr. Barker, Professor of Medicine, Johns Hopkins University, says: 'If Sanatogen consists simply of casein and sodium glycerol phosphate, it is pretty obvious that all of its good effects (excepting perhaps the psychic influence of taking an expensive and, to the layman, mysterious product) can be gotten by including eggs and milk in the food.'"

"Dr. Folin of the Harvard Medical School says: 'For myself, or for any one who would take my advice, I would prefer a glass of milk to Sanatogen when hungry and plain glycerol phosphate to Sanatogen when in need of a tonic. Medicated food used to be sold for horses. To me the "food tonic" combination represents one of the most unscrupulous fake ideas used by manufacturers of patented articles to fool the public.'"

"Dr. Lusk of Cornell University, after condemning Sanatogen and stating that its nutritive material could be secured in one pint of milk, comments upon the value of the glycerol phosphate as follows: 'That sodium glycerol phosphate has any distinctly beneficial physiological action has never to my knowledge been shown.'"

In spite of these words of condemnation Sanatogen is strongly endorsed by certain European scientists and literary men of more or less reputation. It is difficult, therefore, for the layman to venture an opinion as to its merits as a food and a tonic, other than to point out that its chief constituents, casein and organic phosphorus, may be obtained just as well in milk and eggs at a very much lower cost.

Pinex.

26942. *Pinex,* The Pinex Co., Ft. Wayne, Ind. "Alcohol 17 per cent., 22 minims chloroform per fluidounce, and other valuable ingredients." "Pinex is guaranteed to do all that is promised in the Booklet" (which accompanies each bottle). Capacity of bottle, 2.5 fl. ozs.; cost, 50 cents. A thick, reddish brown liquid, having the odor and taste of tar and chloroform.

The following analytical data were obtained:

Specific gravity at 15.5° C.	1.2220
Alcohol by weight	11.70
Alcohol by volume	18.00
Total solids	60.00
Glycerine	19.50
Solids—glycerine	40.50
Sucrose (by Clerget)	27.19
Tar, etc. (by difference)	13.31

Ash	2.11
Polarization, direct at 23° C	+28.4
" after inv. at 23° C.	—7.26
Sulphates, chlorides, sodium, potassium, carbonates (in ash)	present
Croton oil, iodides	none
Chloroform, minims per fl. oz.	17.9

While Pinex is recommended for "consumption, asthma, bronchitis, croup, whooping cough, hoarseness, coughs, colds, la grippe, chronic weakness of the lungs and all diseases of the throat and lungs," a consideration of its claims in connection with consumption alone is especially interesting. In the booklet referred to above we find the following under the caption "Pinex Syrup for Consumption" (Italics are ours):

> "We have told you that Pinex is a concentrated compound extract of Norway pine. You probably know that white pine is a great sedative for any inflammation or irritation of the lungs, throat or bronchial tubes. You also know that pine forests are very healthy to live in; especially so for consumptives. The natives of the pine forests seldom have coughs or consumption. What is the reason? What is there in the air of these regions to be so effective? It is the Guaiacol and several other volatile constituents of the pine. It is the volatile principles of these agents that make a residence in the pine woods of Norway so invigorating to consumptives. In the past 25 years *Guaiacol has been considered by the most celebrated physicians of the day to be the most useful known remedy for consumption.* The Guaiacol in Pinex makes *Pinex an almost certain remedy for consumption.* . . . Two other very essential things in curing consumption are plenty of *'fresh air' and good, plain, substantial, wholesome food.* Years of experience among physicians has proved that *'fresh air' and good food alone will often cure consumption,* even in deep-seated cases. . . . Plenty of good fresh air and Pinex will do all that could be done were you living in the Pine woods of Norway. . . . For any cough get the best remedy you know. Don't risk some puny remedy, for nothing can be too sure. It means everything to know that *when you give Pinex Cough Syrup you are safe."*

There are both truth and distortion of the truth in the above claims. There is no doubt that fresh air and abundant nutritious foods are useful in preventing consumption and in the checking of an incipient tendency towards that disease. It is also true that "fresh air and good food alone will often cure consumption." The above statements, however, have no connection whatever with Pinex. The guaiacol in Pinex does not make Pinex "an almost certain remedy for consumption," for there is no such "almost certain remedy," and while traces of guaiacol may be present in Pinex, *we were unable to detect any by the U. S. P. tests.* The statement that "when you give Pinex Cough Syrup you are safe" would be consoling if true.

Guaiacol, or creosote of which guaiacol is an important constituent, is recognized as of value in the treatment of consumption. No medicine, however, can take the place of fresh air and nutritious diet, and self-medication is always dangerous, especially in the case of a disease like consumption.

Pinex is not supposed to be used in the form in which it is sold. The 2.5 ozs. sold are to be "combined with syrup or strained honey, making a full pint of excellent laxative cough medicine." With reference to this point the booklet says:

> "Our reason for not placing Pinex on the market already prepared is that we are teaching you Health Economy. Most cough medicines contain a large quantity of Sugar Syrup—a very useful element and not expensive. When you buy Pinex you pay for the medicinal ingredients only."

In spite of these statements we find 27.19 per cent. of sugar and 19.50 per cent. of glycerine in Pinex, showing the claim to be both misleading and untrue.

FOOD AND DRUG PRODUCTS EXAMINED FOR THE DAIRY AND FOOD COMMISSIONER.

Seven hundred and fifty-seven samples were referred to this station by the Dairy and Food Commissioner for examination. Since the details regarding them will be found in this report, only a brief summary of the results is here given, except in the case of turpentine, where quite complete analytical data were secured.

Of the whole number of samples examined, 354 were not found to be adulterated, while 372 were adulterated, misbranded, or below standard.

Butter and Butter Substitutes. Of thirty-nine samples examined eighteen were butter, ten oleomargarine and eleven renovated butter. One sample of renovated butter, claimed to weigh one pound, weighed only 14.4 ozs. In many cases the illegality of the sale consisted in the failure to display the required sign when selling oleomargarine, or failure to stamp renovated butter at the time of sale.

Candy. Six samples of candy examined were in all cases free from paraffin and added mineral matter. Where chocolate was claimed, no foreign fat was present. All contained glucose, and one was colored with amaranth, a permitted coal-tar color. All the samples were passed. The analyses are given below:

			Fat.		Polarization at 18°.		
	Water.	Ether Extract.	Ref. Ind. 40°.	Melting Point.	Direct.	Invert.	Ash.
*Chocolate Nut Caramels..	9.35	6.31	1.4567	31°	+109.4	+41.1	0.49
Chocolate Creams........	10.71	9.38	1.4567	32°	+ 98.6	+17.2	0.58
Chocolate Mints.........	10.38	11.09	1.4577	31°	+ 97.0	+18.3	0.70
Chocolate Creams........	10.65	9.97	1.4569	32°	+ 92.0	+20.5	0.62
†Chocolate Nut Caramels..	9.49	10.32	1.4566	30°	+ 88.0	+24.4	0.94
‡Strawberry Jellies........	16.50	0.15	......	..	+118.0	+34.3	0.23

Cider. The sample examined contained benzoic acid.

Cinnamon. Two samples were tested with the following results:

Ether Extract.			Ash.		
Total.	Volatile.	Non-Volatile.	Total.	Water-Sol.	Acid Insol.
3.51	1.53	1.98	4.87	1.31	1.58
1.72	0.46	1.26	5.15	1.64	0.47

The microscope showed no added adulterant in either sample, but the volatile and non-volatile ether extract in the second sample were both too low for genuine cinnamon.

Cocoa. The three samples examined were all misbranded and one was adulterated with sugar. Bartlett's Ralston Health Club Cocoa contained 54.38 per cent. sucrose, which was not declared on the label. Bensdorp's Royal Dutch Cocoa showed high ash and high alkalinity of ash. The claims that it was "the purest cocoa made" and that it was "soluble" were both untrue. Isenburg's White Lily Cocoa contained 22.76 per cent. of fat and 3.26 per cent. of nitrogen; it was therefore not "double the strength of ordinary grades of cocoa," as claimed on the label.

Coffee. The sample examined was not found adulterated.

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* The nuts made up 6.7 per cent. of the sample. † The nuts made up 9 per cent. of the sample. ‡ Contained amaranth, a permitted coal-tar dye. None of the samples contained paraffin.

Cream. One of the two samples tested contained only 11.25 per cent. of fat, and was therefore below the legal standard. Neither sample contained a chemical preservative.

Grape Juice. A sample of Puritan Grape Juice was found to contain only natural color.

Ice Cream. Twenty-five samples were tested for butter fat, which ranged from 1.0 to 18.5 per cent. Three samples were notably deficient, containing only 1.0, 3.0 and 4.0 per cent., respectively.

Lemon Extract. One of the two samples tested contained 8.9 per cent. lemon oil, with natural color. A sample of French's Triple Strength Lemon Extract contained no lemon oil, and was colored with napthol yellow S, a permitted coal-tar color. The carton claimed "triple strength," the bottle "genuine extract," and a sticker on both the carton and bottle stated in very fine print that it contained "no" lemon oil, a series of inconsistent and misleading statements clearly making the sample misbranded.

Milk. Two hundred and sixty-five samples were examined. Of these forty-five conformed to the legal standards, while sixty-one were deficient only in solids-not-fat. Eighty-five samples were below standard in solids, thirty-four in fat and one hundred and forty-nine in solids-not-fat, two hundred and twenty samples failing to meet the legal requirements in one or more particulars. Four samples were skimmed and fifty-seven were watered. It is to be remembered that these figures do not correctly indicate the true state of Connecticut market milk, as with few exceptions these samples were taken because they *were* suspicious and complaints had been made of the vendors.

The watered samples were taken in Branford, Cheshire, Hebron, Middletown, New Canaan, Rocky Hill, Seymour, Somers, Stafford Springs, Stratford, West Haven, Winchester and Woodbridge. These samples averaged 10.09 per cent. solids, two samples containing only 6.75 and 6.96 per cent.

Skim Milk. Two samples of skimmed milk were found to be watered. These contained 7.56 and 7.84 per cent. solids and 0.13 and 0.21 per cent. fat, respectively.

Molasses. One hundred and sixty samples were examined chiefly for the presence of glucose. In certain samples, showing low polarization, water was also determined. No adulteration was found in one hundred and forty-eight samples. The direct polarization in these ranged from +17.8 to +50.8, average, +36.7; the polarization after inversion from —8.8 to —17.8, average, —17.5; all at 18° C. One sample contained glucose, polarizing +96.6 direct and +72.2 after inversion. The remaining eleven samples exceeded the standard's limit for water, 25 per cent., ranging from 25.23 to 27.53 per cent.

Olive Oil. One sample was unadulterated, while another contained cottonseed oil.

Rice. Eighteen samples were examined, nine of which were passed, and nine were found to contain talc or similar material. (See page 121).

Sausage. Sixty-eight samples of sausage, frankfurts, etc., were tested for starch, boric acid and sulphites. None of the samples contained boric acid. Twenty-seven samples were passed; these contained from 0.00 to 0.88 per cent. starch, and from none to 2.2 mgms. of sulphurous acid per 100 gms. of material. One sample was rotten when received and totally unfit for human consumption. Thirty-four samples contained starch, ranging from 1.01 to 6.56 per cent., average, 3.02 per cent. Two samples contained excessive sulphurous acid, 6.6 and 9.4 mgms. per 100 gms. Four samples, all frankfurts, contained a coal-tar dye and from 3.22 to 4.73 per cent. of starch. In two cases the dye was identified as ponceau and amaranth, respectively, both permitted colors.

Vanilla Extract. A sample of Alliance Brand was found to be genuine, containing 0.209 per cent. vanillin, and no coumarin or caramel.

Acetic Acid. Three samples were examined, one of which sold by A. L. Embree, Stamford, contained only 28.12 per cent. acid, or 78.1 per cent. U. S. P.

Asafetida, Powdered. Eleven samples were analyzed, ten of which failed to satisfy the U. S. P. standards for alcohol-soluble resins and ash. (See page 152.) Another sample, taken on the request of a large wholesaler and guaranteed to contain 61.3 per cent. soluble resin and 16.675 per cent. ash, contained 61.84 and 17.18 per cent., respectively, showing that a high-grade powdered asafetida is by no means an impossibility, as often claimed.

Citrate of Magnesia. Twelve samples of solution of magnesium citrate were examined. Four of these were within 10 per cent. of the U. S. P. standard, four were deficient in magnesia, one in potash, and three in both of these ingredients. (See page 164.)

Precipitated Sulphur. Three samples were examined, one of which sold by Goldfield Bros., Hartford, was ground brimstone and not the drug claimed. (See page 172.)

Turpentine. One hundred and thirty samples were examined. Full analytical details are given on page 176.

Net Weight Samples. Two hundred and eighty-eight samples were examined in connection with a study of the variations in net weight and volume of package goods. The results of this study are given in detail in Bulletin 172 of this station, and certain data as to individual brands on pages 139 to 145 of this report.

MISCELLANEOUS MATERIALS SENT BY PRIVATE INDIVIDUALS.

Milk. Twelve of the twenty-one samples tested satisfied the legal standard, while seven were below it. One sample tested for preservatives only contained no boric or benzoic acid or formaldehyde. One sample, the duplicate sample taken by a city milk inspector, contained 18.23 per cent. solids and 9.4 per cent. fat; the seal was in poor condition and the sample was apparently tampered with in a very clumsy manner. In addition to these the morning and evening milk of the individual cows of a herd of fourteen were tested for fat. This ranged from 3.8 to 6.1 per cent. for the morning and from 4.4 to 8.1 per cent. for the evening milk, the latter averaging 0.8 per cent. higher.

Cream. Four samples were tested, ranging from 17.5 to 55.5 per cent. of fat. Sucrate of lime was found in none of the samples.

Skim Milk. The single sample tested contained 9.98 per cent. solids and 1.4 per cent. fat.

Condensed Skim Milk. The samples contained 0.85 per cent. fat, and gave a negative test for sucrate of lime.

Butter. Of the three samples tested one was genuine, one was renovated butter, while the third was an inferior product, probably containing some renovated butter.

Near Beer. A sample sent in by the State Police showed a specific gravity at 15.5° C. of 1.00303, and contained 1.36 per cent. alcohol by weight and 1.73 per cent. by volume.

Baking Powder. The sample proved to be a phosphate powder.

Celery. A sample covered in places with a considerable quantity of a greenish deposit was examined. This deposit was found to consist chiefly of copper carbonate, probably the result of spraying, but no arsenic was present. It was reported that much of the celery sold in the Bridgeport markets was found by the local inspectors to contain this contamination.

Cider. The sample examined had the following analysis: Specific gravity at 15.5° C., 0.99786, alcohol by volume, 6.58, solids, 1.56, acidity, 0.36, ash, 0.28, polarization at 20° C. (200 min. tube), —0.5°; salicylic and benzoic acids absent.

Ice Cream. The sample tested contained 10.50 per cent. of fat.

Fruit Syrups. Four samples of strawberry syrup were tested for glucose, one of which contained this sugar. A sample of peach syrup, claimed by a certain New Haven newspaper to have poisoned a woman drinking a soda water flavored with it, was tested for hydrocyanic acid with negative results. It was, however, colored with a coal-tar dye, but reliable evidence showed the woman's sickness to have been due to other causes.

Jam. The sample of strawberry jam examined contained no glucose.

Oysters. A sample of Saltesea Oysters, put up by the American Oyster Co., Providence, R. I., contained no salicylic, benzoic or boric acids. The total net weight of the sample was 502 gms., of which 393 gms. was oysters and 109 gms., or 21.7 per cent., the drained liquor.

Peanut Butter. The single sample tested proved to be genuine, no oil other than peanut being detected.

Lemon Extract. A sample made by Polk & Calder Drug Co., Troy, N. Y., was found to be genuine. Its analysis was, specific gravity at 15.5° C., 0.8162, alcohol about 92 per cent., lemon oil, 5.3 per cent., color, natural, wood alcohol, none.

Sage. The sample made by the R. T. French Co., Rochester, N. Y., was found to be genuine.

Spaghetti. A sample of Marvelli Spaghetti, made by the Marvelli Co., Harbor Beach, Mich., was claimed to be very rich in gluten and low in starch, and hence permissible for the use of diabetic patients. It contained only 15.50 per cent. of protein.

Vinegar. Twelve samples were tested for solids and acidity. They ranged from 0.56 to 4.92 per cent. acidity, and from 0.77 to 2.75 per cent. solids. Only three of the samples satisfied the legal requirements in both respects.

Malt Carbonic. Two samples of Sunlight Brand Ebling's Malt Carbonic, made by The Ebling Brewing Co., New York, were sent by officials from "no license" towns. One sample contained 3.08 per cent. alcohol by weight and 3.93 per cent. by volume. The complete analysis of the other sample follows:

Specific gravity	1.0167	Ash	0.13
Water	91.09	Phosphoric acid	0.035
Alcohol, by weight	3.34	Dextrin	1.53
" by volume	4.27	Dextrose	0.00
Extract	5.57	Maltose	3.59
Crude protein	0.24	"Bitters" (sol. in alcohol and ppt. by lead)	present

The distribution of the sugars and the amounts of extract, protein and phosphoric acid indicate that the product is a malt liquor. The liquor has the nature, substance and quality of beer, and its sale is illegal where the sale of alcoholic beverages is forbidden.

Poisoning Cases. Several samples of soils, feeds, etc., which were suspected of having caused poisoning in cattle, were analyzed. Two samples of wheat middlings, sent by F. F. Brewster, New Haven, contained arsenic and copper, probably in the form of Paris green. A material sent by J. L. Gardner, Central Village, was tested for arsenic and alkaloids with negative results. Four samples were sent by R. Wohlgeschaffen, Turnerville, two consisting of portions of stomach tissues of cows which had died suddenly, and two consisting of portions of the stomach contents from the same cows. All four samples contained considerable arsenic. Eight samples of soil sent by G. Martin, Milford, were tested for arsenic with negative results. The stomach contents of a cow, sample also sent by Mr. Martin, contained large quantities of lead and arsenic.

TABLE XXXIV.—SUMMARY OF RESULTS OF EXAMINATION OF FOOD AND DRUG PRODUCTS IN 1912.

	Not found *Adulterated.	*Adulterated or below standard.	Compound.	Total number examined.
Sampled by Station.				
Corn, Canned	..	..	..	36
Dried Fruits	..	2	20	102
Gluten and Special Foods	5	6	..	11
Honey	25	‡1	..	26
Rice	21	‡18	5	44
Tomatoes, Canned	§32	9	..	41
Acetic Acid	15	10	..	25
Aconite, Powdered	1	5	1	7
Asafetida, Powdered	2	15	..	17
Fig Syrup Laxative	..	..	..	13
Glycerine	30	..	..	30
Heroin Tablets	3	1	..	4
Magnesium Carbonate	7	¶7	4	18
Magnesium Citrate, Solution	4	27	..	31
Opium, Gum	1	..	..	1
Opium, Powdered	5	..	..	5
Paregoric	32	7	..	39
Sodium Salicylate	8	†5	..	13
Sulphur, Precipitated	12	3	..	15
Proprietary medicines, etc	..	..	..	18
Total	203	116	30	496
Sampled by Dairy Commissioner.				
Butter and Butter Substitutes	18	21	..	39
Candy, Cider, Cinnamon, Cocoa, Coffee, Cream	9	6	..	15
Grape Juice, Lemon Extract, Skim Milk, Olive Oil	3	4	..	7
Milk	45	‖220	..	265
Molasses	148	12	..	160
Rice	9	9	..	18
Sausage	27	41	..	68
Vanilla Extract	1	..	..	1
Acetic Acid	2	1	..	3
Asafetida, Powdered	1	10	..	11
Magnesium Citrate, Solution	4	8	..	12
Sulphur, Precipitated	2	1	..	3
Turpentine	85	39	6	130
Package Goods (net weight study)	..	..	..	288
Total	354	372	6	1045
Sampled by Private Individuals.	61	20	1	104
Total from all sources	618	508	37	1645

* Also includes misbranding. † Short weight. ‡ One short weight. § Probably many of these also contained added water. ¶ All short weight, and one misbranded as well. ‖ Includes 61 samples below standard in solids-not-fat only.

PART III.

TWELFTH REPORT

OF THE

State Entomologist of Connecticut

To the Director and Board of Control of the Connecticut Agricultural Experiment Station:

I transmit herewith my twelfth report as State Entomologist of Connecticut. It contains an account of the activities of my office for the calendar year of 1912, but as in previous reports the statements regarding finances and the inspection of imported nursery stock apply to the State fiscal year ending September 30th.

Respectfully submitted,
W. E. BRITTON,
State Entomologist.

REPORT OF THE RECEIPTS AND EXPENDITURES OF THE STATE ENTOMOLOGIST FROM OCTOBER 1ST, 1911, TO SEPTEMBER 30TH, 1912.

Insect Pest Account.

RECEIPTS.

From E. H. Jenkins, Treasurer	$3,000.00
Account of 1911, balance	765.99
Miscellaneous	12.93
	$3,778.92

EXPENDITURES.

For Field, office and laboratory assistanee:		
B. H. Walden, salary	$1,080.00	
H. B. Kirk, salary	562.50	
D. J. Caffrey, salary	219.00	
E. B. Whittlesey, salary	301.00	
F. M. Valentine, salary	150.00	
Other assistance	110.13	
		$2,422.63

Printing and illustrations	$281.88	
Postage	56.02	
Stationery	17.35	
Telegraph and telephone	3.90	
Express, freight and cartage	6.65	
Library	184.67	
Laboratory apparatus and supplies	97.51	
Office supplies	57.32	
Traveling expenses	390.88	
Balance, cash on hand	260.11	
		$3,778.92

Gypsy Moth Control Account.

RECEIPTS.

From E. H. Jenkins, Treasurer	$2,500.00
Account of 1911, balance	168.97
	$2,668.97

EXPENDITURES.

For Salary, labor, board of scouts, etc.:			
D. J. Caffrey, salary	$ 766.00		
Labor, board of scouts, etc.	1,268.79		
		$2,034.79	
Printing and illustrations		2.40	
Tools and supplies		54.84	
Telegraph and telephone		.25	
Express, freight and cartage		1.98	
Traveling expenses		343.64	
Balance, cash on hand		231.07	
			$2,668.97

Memorandum:—This account of the State Entomologist has been duly audited by the State Auditors of Public Accounts.

PUBLICATIONS OF THE ENTOMOLOGICAL DEPARTMENT, 1912.

By W. E. BRITTON:

Eleventh Report of the State Entomologist (Part IV of Station Report for 1911): 88 pages, 10 text figures, 16 plates; 9,000 copies distributed in March, 1912.

Report of Committee on Injurious Insects: Proceedings Connecticut Pomological Society, 1912, p. 37, 4 pages.

Progress in Exterminating Two Isolated Gypsy Moth Colonies in Connecticut. *Journal of Economic Entomology,* Vol. V, p. 194, 2 pages, April, 1912.

Spread of the Leopard Moth in Connecticut and Its Injury to Shade Trees. *Journal of Economic Entomology,* Vol. V, p. 241, 2 pages, June, 1912.

The House Fly as a Disease Carrier and How Controlled. Bulletin Connecticut State Board of Health, 10 pages, 1 plate, June, 1912.

The Rôle of the House Fly and Certain Other Insects in the Spread of Human Diseases. *Popular Science Monthly,* Vol. LXXXI, p. 36: 14 pages, 5 figures, July, 1912.

The Mosquito Plague of the Connecticut Coast Region and How to Control It. Bulletin 173 of this Station: 14 pages, 4 plates; 10,000 copies, July, 1912.

Review of Sanderson's "Insect Pests of Farm, Garden and Orchard," *Science,* June 14, 1912.

The Leopard Moth (Summary of Bulletin 169 of this Station) with Illustrations. *Connecticut Farmer,* January 13, 1912.

Inspection of Apiaries in 1911, *Connecticut Farmer,* February 24, 1912.

Inspection of Imported Nursery Stock in Connecticut, *Connecticut Farmer,* June 15, 1912.

Improvement of Salt Marshes, *Connecticut Farmer,* August 3, 1912.

The House Fly and Its Relation to Typhoid Fever, Proceedings of the Sixth Sanitary Conference of the Health Officers of Connecticut (with discussion); 17 pages, October, 1912.

Notes of the Year from Connecticut, *Journal of Economic Entomology,* Vol. V, p. 464, December, 1912, 2 pages.

Inspection of Apiaries in 1912, *Connecticut Farmer,* November 23, 1912.

By G. P. Clinton and W. E. Britton:

Test of Summer Sprays on Apples, Peaches, etc. (Part V, Report of this Station for 1911), 60 pages, 8 plates. 9,500 copies, May, 1912.

By B. H. Walden:

Common Household Insects. *Connecticut Farmer,* March 16, 1912.

White Pine Weevil, *Connecticut Farmer,* July 6, 1912.

Entomological Staff.

W. E. Britton, Ph.D.	*State and Station Entomologist.*
B. H. Walden, B.Agr.	*First Assistant.*
Donald J. Caffrey, B.S.	*Assistant.*
Harry B. Kirk*	*Assistant.*
Miss E. B. Whittlesey†	*Stenographer.*
Miss Frances M. Valentine‡	*Stenographer.*

Mr. Walden has continued as assistant and takes charge of all work in my absence from the office. Mr. Caffrey has been in charge of all field work in suppressing the gypsy and brown-tail moths, and when not needed there has helped in the inspection of nurseries. Mr. H. B. Kirk was engaged to fill the place of Mr.

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* Beginning February 15th, 1912.

† Until August 1st, when transferred to botanical department.

‡ Employed temporarily June 17th and regularly since August 1st.

A. B. Champlain, who resigned October 1st, 1911. Mr. Kirk began his work February 15th, 1912, and came to Connecticut from the Division of Economic Zoölogy, Harrisburg, Pa. Mr. Kirk has aided in the inspection of nurseries and of imported nursery stock and has studied the walnut weevil and bud-moth during the summer and also made observations on white pine insects. He specializes in the beetles (order Coleoptera) and has spent considerable time on the collection. He will also assist Mr. Caffrey in scouting for gypsy moth egg masses and brown-tail nests during the winter.

Mr. J. Kirby Lewis, a student of the Massachusetts Agricultural College, was employed during his summer vacation, from June 18th to September 7th, as a general laboratory assistant. So far as is practicable, local help has been employed in the gypsy moth work at Wallingford and at Stonington, and in part on the brown-tail work in the northeastern corner of the State.

Messrs. H. W. Coley of Westport and A. W. Yates of Hartford have continued as apiary inspectors and are paid by the day for the time employed.

Miss E. B. Whittlesey continued to work half of each day as stenographer, until her vacation, July 1st. Miss Frances M. Valentine was employed June 17th to do some special clerical work and to fill the position of stenographer during July. On Miss Whittlesey's return, August 1st, she was transferred to the Director's office for a time and later to the botanical department and Miss Valentine was given a position in this department, working full days, the extra work being necessary.

Much of the success of the work of the department is due to the faithfulness and efficiency of the persons mentioned above, and their services are not unappreciated.

Chief Lines of Work.

Certain routine and police duties are required by law of the State Entomologist, such as suppressing the gypsy and brown-tail moths, the annual inspection of nurseries, the inspection of apiaries on complaint, and the examination of orchards on request. In addition to these prescribed duties for the past four years an attempt has been made to inspect all woody field-grown imported stock to safeguard the State against insect and fungous pests liable to be introduced in this way. The inspection work in each of its several divisions is described more in detail in the following pages.

Some studies of scientific value have been made during the year. Mr. Kirk devoted a portion of his time in the summer months to investigating the life history, habits, and damage of the walnut weevil, *Conotrachelus juglandis,* Lec. This work, except for further tests of remedial treatment, has been completed, and a comprehensive account of it is given on page 240 of this report. Mr. Kirk also studied another insect, a bud-moth; of the genus *Acrobasis* which causes much injury to walnuts and often works conjointly with the walnut weevil. The results of this work appear in the paper on page 253.

For three years Mr. Walden has made observations on a species of sawfly which he found defoliating cultivated blackberries in a field near New Haven. During the past season he obtained sufficient data to complete his knowledge of the life history of this insect. The species being a new one, was described recently as *Pamphilius dentatus* by Prof. A. D. MacGillivray. The article on page 236 of this report contains all the known facts regarding this insect.

A start has been made in a study of the white pine weevil, *Pissodes strobi* Peck, and other insects attacking pine trees in Connecticut, but several seasons will probably be necessary to obtain the data that would warrant publishing a report.

Some attention has been given to the general care of the orchard trees on the Station farm at Mt. Carmel, where several minor investigations are still in progress.

The control of the mosquito nuisance was actively taken up by several organizations and individuals, during the season, and this office has endeavored to coöperate wherever and whenever possible by furnishing information and advice, and in a number of cases has sent an expert to examine and report upon the suspected territory and to inspect drainage or oiling work. A fuller report of this phase of our work is given on pages 259-288.

There has been a greater demand for popular lectures than ever before, especially regarding the housefly and the mosquito, subjects connected with public health. These demands have been met, if possible, and in most cases the lectures have been illustrated with lantern slides, charts or specimens. Of the thirty lectures given during the year by Messrs. Britton and Walden, twelve have been illustrated with lantern slides, and twenty-one (eight illustrated) have dealt with flies and mosquitoes.

There has also been a considerable increase in the correspondence and other clerical work of the office.

In connection with the general station exhibit the entomological department made an exhibit of its work at three agricultural fairs as follows:

Norfolk Agricultural Association, Norfolk	Sept. 19-20
State Fair, Berlin	Sept. 24-28
Suffield Fair, Suffield	Oct. 1- 2

This department exhibit was similar to that of last season described in the Report of 1911, p. 264, though somewhat less space was occupied, about 1,200 square feet being used. The mosquito exhibit was made more of a feature than previously and a number of new charts and enlarged photographs added considerably to the appearance of the display.

SUMMARY OF INSPECTION AND OFFICE WORK, 1912.

315	samples of insects received for identification.
53	nurseries inspected.
52	regular certificates issued.
7	parcel certificates issued.
31	orchards and gardens examined.
987	boxes and packages imported nursery stock examined.
153	apiaries containing 1431 colonies inspected.
73	apiaries containing 337 colonies found infested with European foul brood and treated.
2746	letters written on official work.
179	mail and express packages sent out.
432	bulletins mailed on request or to answer inquiries.
30	lectures and addresses made before granges, clubs and civic organizations.

ENTOMOLOGICAL FEATURES OF 1912.

The winter of 1911-12 was characterized by low temperatures and the ground remained frozen nearly all of the time from December until March. The ground was covered with ice but there was little snow.

Many trees in orchards and in woodlands were apparently injured, either directly by the winter, or, possibly, by the drought of 1911, followed by rains, stimulating a late growth which was easily damaged by the freezing. At any rate, the buds were killed in nearly all peach orchards, except near the coast, and many oak trees have died during the drought of July and August, 1912, which were probably injured the previous winter. A number of others, half-dead, show signs of winter injury to roots or stems. The cool, moist weather of May favored a luxuriant foliage development on trees, and after the few hot, sunny days of June and July leaf scorch troubles developed on many trees, especially sugar maples.

Seasonal conditions, especially absence or abundance of moisture, winter changes and low temperature have a direct or indirect effect on the scarcity or abundance of the various kinds of insects. The cold, wet spring seemed favorable to the increase of aphids and nearly all kinds were abundant. The rosy apple aphis, *Aphis sorbi* Kalt., was more prevalent and caused more damage than since 1909, many orchards being seriously injured and the fruit stunted by it. The green apple aphis, *A. pomi* DeG., was also common but it causes less injury to bearing trees than *A. sorbi* and its principal damage consists in checking the growth of young trees in orchards and nurseries.

Perhaps the most prominent feature of the season was the great abundance of white grubs (*Lachnosterna* sp.) and the damage caused by them. There were many complaints and several specimens were sent to this office. Evidently the drought favored them as they did more damage than I have seen during a residence of eighteen years in the State. Not only were grass fields attacked and injured, but corn, strawberries and potatoes were also damaged and in some cases nearly destroyed by the grubs. In a forest nursery near New Haven, nearly twenty-five per cent. of the seedling conifers and some deciduous trees were eaten off below the surface of the ground.

The fall army worm, *Laphygma frugiperda* S. & A., was received from Stonington, Groton and from two different localities in New Haven. In three of these places the caterpillars were devastating lawns, and in the other case they were feeding upon a field of millet.

The birch leaf skeletonizer, *Bucculatrix canadensisella* Chamb., though much less abundant than in 1910, was found over the entire State as in 1911, and was particularly noticeable on the yellow birches in Litchfield County in September. It was also received at this office on cut-leaf and other ornamental birches from various localities.

The leopard moth, *Zeuzera pyrina* Linn., which was fully described in Bulletin 169 and in the report of 1911, continues its destructive work on the shade trees of the shore towns and cities.

The gypsy moth, *Porthetria dispar* Linn., has apparently been exterminated at Stonington, and nearly so at Wallingford. The brown-tail moth, *Euproctis chrysorrhoea* Linn., is spreading a few miles each year towards the south and east. In time it will doubtless spread over the entire State. Though it is held in check by its natural enemies and by the destruction of winter nests and by spraying, it cannot be wholly eradicated as can small colonies of the gypsy moth, because both sexes fly. Detailed accounts of our work against both these insects will be found in this report.

Cut-worms were fairly abundant in June and did their usual amount of injury.

The elm leaf beetle, *Galerucella luteola* Mull., though causing little injury in towns where spraying was thoroughly and universally practiced, ravaged the unsprayed trees in many places, including the roadside and meadow trees of the open country. This insect seems to be now particularly prevalent in the northwestern portion of Connecticut.

The fall canker-worm, *Alsophila pometaria* Harr., as in past seasons, continues to damage apple and elm trees in certain localities.

The spiny elm caterpillar, *Euvanessa antiopa* Linn., was received from a number of correspondents in various portions of the State. Though possibly not as abundant as in 1911, it was nearly as prevalent. Persons often mistake the larvæ for gypsy caterpillars, but the resemblance is slight.

Injury was reported to fruit by the rose chafer, *Macrodactylus subspinosus* Fabr., and the bumble flower beetle, *Euphoria inda* Linn. The white marked tussock moth caterpillars, *Hemerocampa leucostigma* S. & A., were feeding upon a California privet hedge in New Haven in July. The red-humped caterpillar, *Schizura concinna* S. & A., and the yellow necked caterpillar, *Datana ministra* Dru., were in their usual abundance devouring the leaves of young fruit trees late in the season.

The San José scale, *Aspidiotus perniciosus* Comst., was present as usual, and in certain orchards, though thoroughly sprayed, the fruit showed considerable infestation at harvest time. The oyster shell scale, *Lepidosaphes ulmi* Linn., and the scurfy scale, *Chionaspis furfura* Fitch, are present in rather constant numbers year after year but do no very serious damage in Connecticut orchards which otherwise receive good care.

The scale insects which at present attract the most attention are the tulip tree scale, *Toumeyella liriodendri* Gmel., and the woolly maple leaf scale, *Phenacoccus acericola* King. The pine bark aphis, *Chermes pinicorticis* Fitch, is seemingly on the increase and many inquiries regarding it have been received.

The cotton moth, *Alabama argillacea* Hubn., which attracted attention late in September, 1911, by its abundance in its northward flight, also appeared October 11th and 12th, of this year, but in much less numbers than in 1911, and more than two weeks later in the season.

The season of 1912 was a notable one on account of the great abundance of mosquitoes. The frequency of the high tides, together with the long period during which the salt marshes were flooded, gave the salt marsh species a favorable opportunity for multiplying, and they took advantage of it. Thus where no control measures were adopted the salt marsh mosquito, *Culex sollicitans* Walk., was extremely abundant late in the summer, and the rain barrel or house mosquito, *Culex pipiens* Linn., was likewise common and was the source of much annoyance.

INSPECTION OF CONNECTICUT NURSERIES.

The annual inspection of nurseries as required by law was commenced August 26th and finished about the middle of October. The work was done by Messrs. Walden, Caffrey, Kirk and Lewis. Two nurseries were inspected twice, once in the spring and again in the fall. The nursery business is on the increase in Connecticut and a number of the nurserymen have increased their area of growing nursery stock. When this office was established in 1901, the first list of Connecticut nurserymen receiving certificates contained twenty-five names. About half of those nurserymen are still in the business, and the present list has fifty names.

NURSERY FIRMS IN CONNECTICUT RECEIVING CERTIFICATES IN 1912.

Name of Firm.	Location.	Certificate issued.	Number of certificate.	Number of acres in nursery.	Kind of stock grown.
Barnes Brothers Nursery Co.	Yalesville	Oct. 8	490	134	Three-fourths fruit; ornamental.
Beattie, Wm. H.	New Haven	" 21	505	1*	Ornamental only.
Bowditch, J. H.	Pomfret Center	Aug. 23	470	8	Rare ornamental.
Brainard Floral and Nursery Co.	Thompsonville	Oct. 1	480	4	Ornamental.
Braley & Co., S. A.	Burnside	Sept. 30	477	1	Fruit and ornamental.
Bretschneider, A.	Danielson	Oct. 5	485	2	Fruit and ornamental.
Brooks Brothers	Westbrook	Nov. 6	511	2	Ornamental.
Burroughs, Thos. E.	Deep River	Oct. 5	482	1	Ornamental; fruit.
Burr & Co., C. R.	Manchester	Sept. 17	473	300	Chiefly fruit; ornamental shrubs.
Chapman, C. E.	North Stonington	Oct. 5	486	4	Small fruits.
Comstock & Lyon	Norwalk	" 24	506	30	Chiefly ornamental; fruit stock.
Conine Nursery Co., F. E.	Stratford	" 5	483	34	Chiefly ornamental.
Conn. Agricultural College (Prof. A. G. Gulley)	Storrs	" 12	494	5	Chiefly fruit.
Conn. Agricultural Experiment Station (W. O. Filley, State Forester)	New Haven	Nov. 6	512	2	Forest tree seedlings; chiefly conifers.
Conway, W. B.	New Haven	Oct 5	488	1	Ornamental.
Cross Highway Nurseries	Westport	" 15	496	10	Chiefly ornamental; some fruit.
Dehn & Bertolf	Greenwich	Sept. 26	476	25	Miscellaneous ornamental.
Dwyer, John E.	Manchester	" 13	472	1	Ornamental.
East Rock Park Nursery (G. X. Amrhyn, Supt.)	New Haven	Oct. 29	508	8	Ornamental and shade trees.
Elm City Nursery Co.	New Haven	Sept. 7	471	100	Ornamental and miscellaneous; conifers.
Gardner's Nurseries	Cromwell	Oct. 15	497	10	Two-thirds fruit; ornamental.
Hartford Park Commissioners (G. A. Parker, Supt.)	Hartford	Dec. 3	517	5	Ornamental only.
Heath & Co., H. S. (2)	Manchester	Sept. 30	479	1	Fruit.
Hilliard, H. J.	Sound View	Nov. 11	513	1	Ornamental.

* One acre or less. Fractions have been omitted.

NURSERY FIRMS IN CONNECTICUT RECEIVING CERTIFICATES IN 1912—*Concluded.*

Name of Firm.	Location.	Certificate issued.	Number of certificate.	Number of acres in nursery.	Kind of stock grown.
Houston & Sons, J. R.	Mansfield Depot	Oct. 5	484	1	Fruit.
Hoyt's Sons Co., Stephen	New Canaan	Sept. 30	478	300	Fruit, ornamental and shade trees.
Hubbard & Co., Paul M.	Bristol	Oct. 11	493	12	Chiefly fruit; ornamental.
Hunt & Co., W. W.	Hartford	Sept. 24	475	10	Mostly ornamental.
Kellner, H. H.	Danbury	Oct. 19	502	3	Fruit, chiefly apple.
Kelsey & Sons, David	West Hartford	" 16	499	2	Fruit and asparagus.
Mount Carmel Forestry and Nursery Co. (C. A. Metzger, Manager)	Hartford	" 19	504	3	Forest tree seedlings, conifers.
Munro, Chas.	New Haven	" 5	487	1	Ornamental only.
New Haven Nurseries Co.	New Haven	Sept. 23	474	7	Ornamental.
Northeastern Forestry Co.	Cheshire	Oct. 19	503	5	Forest tree seedlings, chiefly conifers.
Phelps, J. Wesson	Bolton	Nov. 23	515	1	Asparagus and small fruits.
Pierson, A. N.	Cromwell	Aug. 23	469	1†	Ornamental.
Platt Co., The Frank S.	New Haven	Nov. 22	514	1	Fruit and ornamental.
Purinton, C. O.	Hartford	" 4	510	1	Fruit and ornamental.
Reck, Julius	Bridgeport	Oct. 28	507	1	Chiefly ornamental; fruit.
Ryther, O. E.	Norwich	" 14	495	8	Wholly ornamental.
Schleichert, F. C.	Bridgeport	Dec. 12	518	2	Ornamental stock only.
Scott, J. W.	Hartford	Oct. 18	501	4	Chiefly ornamental; some fruit.
Seavey, Wallace	Waterbury	" 31	509	1	Ornamental.
Sierman, C. H.	Hartford	" 17	500	4	Ornamental and fruit.
Stanhope, B. P.	Niantic	Nov. 27	516	2	Fruit.
Streckfus, H. P.	Litchfield	Oct. 4	481	3	Ornamental.
Turner & Co., Chas.	Hartford	" 9	492	5	Ornamental and fruit.
Vidbourne & Co., J.	Hartford	" 9	491	10	Ornamental.
Woodruff, C. V.	Orange	" 16	498	3	Miscellaneous.
Young, Mrs. Nellie A. (2)	Pine Orchard	" 7	489	1	Ornamental.
Total area devoted to nursery stock				1082	

† Large wholesale florist; many acres under glass.

In 1902, just ten years ago, statistics were gathered showing that the thirty-one nurseries contained about 422 acres. Similar data has been collected the present season and there are now fifty nurseries, containing about 1082 acres.

Fifty-three nursery inspections were made during the year and fifty-two certificates issued.

On the whole the nurseries are each year paying more attention to treating their stock to destroy insect pests, consequently their condition as regards San José scale has greatly improved during the past few years. On account of the danger of distributing certain other pests, which are liable to be found on nursery stock, the Connecticut nurseries are now given a closer inspection than ever before.

Some chestnut trees in one nursery had the chestnut bark disease and were destroyed.

In addition to the regular inspection of growing nursery stock, inspections of several packages have been made at the request of persons who are not nurserymen, but wish to ship certain kinds of stock to other states. Seven package certificates have been issued during the year. Of the names published in the nurserymen's list of last year, two have gone out of the business, one has moved his business into an adjoining State, and the others are on the present list. Four new names have been added.

On pages 218 and 219 is a list of the nurserymen and firms receiving certificates in 1912, together with statistics regarding the area and kind of stock in each nursery. In most cases the acreage given is that supplied by the owner, but in some instances it is the estimate of the inspector.

INSPECTION OF IMPORTED NURSERY STOCK IN CONNECTICUT.*

By W. E. Britton and B. H. Walden.

For the past few years there has been a great increase in the amount and value of the nursery stock imported into the United States from European and other countries. In the natural course of events we should expect that many species not commonly cultivated, horticultural varieties and novelties would be brought into this country for the purpose of increasing the variety of plants available for ornamental planting and of introducing worthy commercial varieties, but we often wonder why such things as California privet, Japanese barberry and the common spiræas, which can be and are so easily grown here, should be imported in such quantities, especially when there is quite a heavy duty to be paid on such stock.

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* A portion of this article was printed in the *Connecticut Farmer*, June 15, 1912.

The chief reasons for the heavy importations are the low prices of labor in Europe, and the fact that soil and climate in certain localities there produce fine plants. Were these the only factors to be considered, such importations would be a benefit, not only to the United States, but also to the countries where the stock is grown. But there are insect and fungous pests in all lands, and a number of them have been brought into the United States on nursery stock, so that the traffic is not an unmixed blessing. Our Government has never established any system of inspecting such stock except for customs duties.

No other important nation lacks such a system of inspection. A few years ago, dead San José scales were found on some dried apples and other fruit shipped into Germany; forthwith all American dried fruits were debarred from Germany. Far more dangerous infestations have been found on nursery stock brought here from Germany, France, England, Holland and Japan, yet until October 1st, 1912, the United States has had no inspection system other than that provided in the separate states, and almost no restrictions on the entrance of such stock.

Early in 1909, winter nests of the brown-tail moth were found on stock from France, shipped into a number of states, including Connecticut, and had it not been for the inspection officers in the separate states, who destroyed all nests found, the whole country would now be infested by this most undesirable addition to our insect fauna.

Previous to 1909, no attempt was made to inspect imported stock in Connecticut, but in order to protect the State and its varied horticultural and agricultural interests, such inspection was given, though there was no provision for it except that the law providing for the control of the gypsy and brown-tail moths, enacted in 1907, liberally interpreted, permitted it.

In 1909 and 1910, brown-tail nests were found on fruit seedlings imported from France, but since then none have been found, though in a number of cases trimmed branches with part of the web remaining showed that the stock had been infested. A number of other kinds of insects, some of which are known to be pests, have been found during the inspections and destroyed. The white pine blister rust has been detected in two or three shipments, and in the spring of this year an importation of 5,000 young pines was destroyed because infested by this disease. Last year a similar disease of junipers from Japan was brought into this State, and as in one of its stages it is injurious to pomaceous fruit in Japan, serious damage might be expected to follow its introduction into Connecticut. We have too many pests already; still, there are several important ones in Europe, and no doubt in other countries, not yet known to be in America. If any one of these becomes established in Connecticut or any other State, the entire country is endangered.

In the season just closed 987 boxes, bales and packages have been inspected by members of the entomological staff. This is more than ever before in a single year, and includes only the hardy plants and woody stock for florists. No attempt has been made to inspect seeds, bulbs, lily-of-the-valley pips, or tender herbaceous plants. Moreover, a number of small shipments of nursery stock could not be inspected because the stock was received and distributed before we were notified of its importation. We have received notice of the arrival of more than 550 boxes, etc., of bulbs and other plant material which we made no attempt to examine, and of about 25 boxes, etc., which could not be traced or found at their point of destination.

The following table shows the amount and source of such stock examined by this office for the past four seasons:

	1909	1910	1911	1912
Belgium	2	91	15	269
England	16	63	91	26
France	71	104	154	97
Germany	93	9	2	9
Holland	109	376	449	534
Ireland	..	18	14	14
Japan	6	26	109	25
Russia	..	1	..	..
Scotland	..	19	2	12
Miscellaneous or unknown	9	..	18	1
Total	306	707	854	987

Congress, at its last session, established the Federal Horticultural Board and provided for a system of applications and permits before any nursery stock can enter the United States, and also gave this Board the right, after due notice and hearings, to establish and enforce quarantine regulations against any country or portion of a country where any serious insect pest or plant disease exists, which is liable to be brought into the United States. This Board also has a similar right to quarantine states or portions of states in this country for the same reasons. This law became operative October 1st, 1912.

The Federal Horticultural Board does not attempt to inspect any stock consigned to the various states having inspection systems, but leaves it to the State inspectors. It does attempt, however, to notify the inspectors regarding the arrival of the stock at the ports of entry. The notice gives the number of the permit issued, name of grower or consignor, name and address of consignee and locality where stock was grown. This enables us, for instance, to trace the stock more easily than we have been able to do in the past, and should result in a careful inspection of a larger proportion of the imported stock needing inspection which is brought into the State. Only field-grown woody plants require inspection under this act. No attempt will be made to inspect herbaceous nursery or florist's stock.

At the present time there is no State provision for this work, but it is important as it safeguards and protects the State from introducing pests in this manner, and there should be some definite provision for its continuance.

INSPECTION OF APIARIES IN 1912.

The inspection of apiaries has been conducted in much the same manner as last year and Messrs. A. W. Yates of Hartford and H. W. Coley of Westport have continued to act as inspectors. An effort was made, however, to inspect apiaries in those portions of the State not previously covered in the work, and considerable European foul brood was found in Litchfield, Torrington, Winchester and Barkhamsted in Litchfield County and some was found in Norwich and Stonington in New London County. Very few apiaries have previously been inspected in these two counties, as no complaints have been filed requiring attention.

In nearly all sections of the State, where apiaries are examined, foul brood is found, and in some cases it does much damage, killing off colonies of bees before its presence is known. Wherever the proper treatment is given, there seems to be no trouble in controlling the disease and in most cases it disappears altogether.

As three hundred dollars is the limit of the appropriation to be expended in any one year, the entire State cannot be covered in a single season. The beekeepers seem to be pleased with the inspection service and treatment, so far as it goes, but at their last meeting they voted to ask for an increased appropriation; and for certain changes in the laws giving authority to inspect without complaints; to place a quarantine upon diseased apiaries; and requiring that a certificate of good health accompany each shipment of bees, whether brought into the State from without or moved from one point to another within the State.

The statistics given below show a summary of the inspection work for the season:

APIARIES INSPECTED, 1912.

	Apiaries.	Colonies.
Number inspected	153	1431
Infested, European foul brood	73	337
Other troubles:		
Pickled Brood	several	
Doubtful	3 cases	
Diseased Adult Bees	6 cases	
Average number of colonies per apiary	9.3	
Total cost of inspection	$299.80	
Average cost of inspection per apiary	1.96	
Average cost of inspection per colony	.21	

GYPSY MOTH CONTROL WORK IN 1912.

By W. E. BRITTON AND D. J. CAFFREY.

Stonington Infestation.

No caterpillars have been found in Stonington since the summer of 1910 and it is probable that the gypsy moth has been eradicated from that locality. Nevertheless, the place will be watched. Mr. Caffrey, in company with two Federal scouts, examined Stonington, beginning January 4th, 1912, and finishing

January 20th. No egg-masses were found. Nevertheless, the trees were banded the following summer, the bands examined for caterpillars and much scouting done in and around the area formerly infested. No gypsy caterpillars were found. Mr. Fred Hoadley was employed on this work and had immediate charge under our direction of applying, examining and removing the bands. Mr. Hoadley commenced work on May 13th, and finished August 17th. Mr. Caffrey spent three days in July scouting in Stonington.

Number of burlap bands	2210
Number of tanglefoot bands	66

Wallingford Infestation.

An account of the scouting operations at Wallingford, during the autumn and winter of 1911, appears in the last report of this Station (see Report for 1911, page 279). At that time five egg-masses were found through the combined efforts of the State and Federal scouts.

The summer work began on May 13th, and on May 14th tanglefoot bands were applied to 128 trees, including all the spruce and cedar trees in the cemetery and several large hickory, walnut and spruce trees about town. This tanglefoot was stirred from time to time to keep it in a viscid condition.

Commencing on May 15th the burlap bands were placed on all the trees, to the number of 5,379, in the area between North Main, Christian, Cherry, Ward and Fair streets. The area thus treated was somewhat smaller than that of the previous two years, due to the diminished size of the territory where egg-masses and caterpillars were found the year before. Two men were employed to examine these bands at regular intervals from May 23d until August 15th. During this period many suspected trees, especially rough-barked maples and elms, were climbed in search of caterpillars, and in addition all shrubbery and vines, impossible to band with burlap, were examined, as well as some of the territory outside the banded area.

The first caterpillar, one-half inch in length, was found June 1st, under the burlap around a large maple tree in front of "The Woodbine" on Center street. On June 10th, fifteen caterpillars were found in the rear of the First National Bank, on Main street, feeding on apple and wild plum. The next day all of the foliage in this vicinity was sprayed with lead arsenate, at the rate of 2½ pounds, of the powdered form, to 50 gallons of water. On June 14th, six more caterpillars were found in the same yard. On June 19th, two caterpillars were found in an adjoining yard. From this time until the end of the season the trees, bushes, fences and outbuildings in this immediate section were examined nearly every day for caterpillars.

The first pupa appeared in the breeding cage on July 6th. On July 22d a pupa was found under the burlap on a maple tree in front of Grosse's, on South Orchard street. The next day this tree was looked over with the aid of a ladder and two full-grown caterpillars found. Careful search of the trees and bushes surrounding this spot failed to reveal any further signs of infestation.

The first adult, a male, emerged in the breeding cage on July 27th. During the last part of the season some search was made for egg-masses on the trunks, fences, etc., where the foliage did not interfere, but none were found.

This work on the trees and the turning of burlap was continued until August 15th, when the burlap bands were removed from the trees and burned; the summer work closing on August 17th.

The result of the work this season shows that twenty-six caterpillars were found and one pupa. It is possible that some caterpillars were killed by the arsenical poison, although none were observed after the spraying. All the caterpillars were found within a very small area, compared with that originally infested, and this fact, together with the small number of egg-masses, caterpillars and pupæ found within the past year, seems to indicate that the insect is well under control at Wallingford.

GYPSY MOTH STATISTICS, WALLINGFORD, 1912.

Egg-masses destroyed	5
Caterpillars destroyed	26
Cocoons destroyed	1
Trees banded with burlap	5379
Trees banded with tanglefoot	128
Trees sprayed (not including shrubs)	11
Trees infested (not including shrubs)	6

Scouting for the Gypsy Moth in the Northwest Corner of the State.

About three weeks during the months of April and May were spent in scouting for gypsy moth egg-masses in the northwest corner of the State.

In 1911 the towns of Great Barrington, Lenox and Stockbridge in Massachusetts, not far from the Connecticut State line, were found to be infested with the gypsy moth. These towns are on the main automobile roads passing through the border towns of this State, and during the summer months, when the caterpillars are active, there is much travel along these roads, with the consequent danger of the caterpillars being carried from the infested districts into Connecticut.

It was therefore deemed advisable to watch this part of the State to guard against any possible introduction of the insect, and to this end the trees in the villages, along the main roads and on many of the large estates in Salisbury, North Canaan, Norfolk, Sharon and Canaan, were examined for egg-masses, but nothing was found to indicate the presence of the gypsy moth at any of these places.

Salisbury.

In the town of Salisbury much time was spent around the village of Lakeville. There are many trees along the streets and in the yards of this village which needed careful examination. The grounds and the road approaching Hotchkiss School were also given careful attention, as automobiles frequently come to the school from all parts of New England.

The main road leading west from Lakeville was followed as far as the road leading to the south, beyond Ore Hill. The surroundings of Ore Hill village were examined and also around the mines. From Lakeville the trees along the road running east to the village of Salisbury were examined, the village itself, the roads running northward, as far as Ball Brook and the Chapinville road for a short distance beyond the railroad tracks. At Twin Lakes are many summer cottages, the owners of which come from many different sections during the summer, and consequently the trees in this vicinity were looked over with especial care.

The road running from Chapinville station north through Chapinville, as far as Hammertown, was followed and included all the territory around Scoville's estate at Chapinville. At Lime Rock the street trees and along the roads to Falls Village were looked over.

NORTH CANAAN.

In the town of North Canaan, the junction point of the C. N. E. and N. Y., N. H. & H. railroads, at Canaan village, was looked upon as a dangerous point, as it is only about a mile distant from the Massachusetts state line, and connected by electric railway and within ten miles of Great Barrington, where the gypsy moth has already been found. Careful search of the entire village and roads leading north to the state boundary failed to reveal any signs of infestation.

The main automobile road out through East Canaan was also followed to the town line, as this is the route generally taken, in traveling between the summer colonies of Lenox and Norfolk. The camp meeting grounds at Pine Grove, three miles south of Canaan, where there are many cottages in the midst of a large pine grove, was visited and gone over carefully.

NORFOLK.

The entire village of Norfolk was examined and for some distance into the surrounding country. The trees around the garages and driveways of the many summer homes in this section were given special attention, as it was feared that caterpillars from some of the infested towns nearby in Massachusetts might be brought in on the numerous automobiles and other vehicles that pass back and forth between these sections during the summer months. It is at this time that the caterpillars are most active, crawling about in going from tree to tree and frequently hanging suspended over the highways. In this manner they may gain access to any passing vehicle and be carried for a long distance, either dropping off along the way or crawling out of the vehicle when it stops. The vicinity of the Music Shed, where the concerts of the Choral Union are given, was examined, as these concerts come during the months of June, and are attended by many people who come from all directions.

The automobile road leading out through West Norfolk, on the way to Canaan, was followed as far as the town line. On the south everything was looked over as far as the second railroad bridge, and on the east, as far as the group of houses around the fork of the roads, and on the north as far as the cemetery beyond Haystack Mountain.

SHARON.

The central part of the village at Sharon and also the road out through Sharon Valley to the state line, towards Millerton, N. Y., was examined.

CANAAN.

In the town of Canaan the only place receiving attention was at Falls Village, where the entire village was examined, including the road leading from the village of Lime Rock and northward on the main automobile road to the village of Canaan.

The result of the work done in these towns would seem to indicate that the gypsy moth has not, as yet, spread into Connecticut at this point from the nearby infested towns in Massachusetts. The danger from this source, however, may be considered to be serious and it will be necessary to keep a close watch on this section, under the conditions now existing.

CONTROLLING THE BROWN-TAIL MOTH IN 1912.

By W. E. BRITTON AND D. J. CAFFREY.

Control measures against the brown-tail moth, *Euproctis chrysorrhœa* Linn., in the northeast corner of the State, were continued on the same plan as in the previous year (see Report for 1911, pp. 281-286). Beginning January 29th, 1912, the towns of Thompson, Woodstock, Putnam, Pomfret, Killingly, Brooklyn and adjoining portions of Union, Ashford, Plainfield, Sterling, Canterbury and parts of Lisbon and Griswold, especially around Jewett City, were scouted for the winter nests, together with the city of Willimantic, part of Norwich and the villages in the town of Stafford.

The amount of territory to be scouted made it necessary to employ two gangs for the work. Mr. J. H. Osgood of Putnam, who had been employed by the city in this work, was placed in charge of one gang, while the other was under the direction of Mr. Caffrey.

The control work of last year has greatly diminished the number of nests, and seems to indicate that the brown-tail moth may be kept from doing serious damage in Connecticut by continuing the present method of control. The limit of territory infested was extended further southward to include the entire town of Killingly, Plainfield as far as Wauregan, Sterling as far as North Sterling, and the eastern edge of Brooklyn as far as Long Brook. Westward along the Massachusetts state line and in the towns of Woodstock and Pomfret the limit of infested territory was reduced about two miles, no nests being found beyond West Woodstock, where a single specimen was taken. Later a single nest was found in Stafford, but in this case it probably came directly from infested territory in Massachusetts.

The greater part of the nests were found along the steam or trolley roads, main highways of travel, or near the towns and villages where the lights were thickest. From many indications it seems probable that the adults are coming in from the adjoining states of Massachusetts or Rhode Island each year, either through their own efforts or are being transported by various means of travel from those two states into Connecticut.

The methods used in scouting were the same as last year. It was found impossible to cover the woodland and brush areas, but the orchards, roadsides, around dwellings, along highways of travel and the open country were very carefully examined for nests. Fruit trees situated close to a house, either in the town or country, prove to be the most likely place to find nests, while the large apple orchards and white oak trees along the roadsides also seem to be preferred by the pests, so these localities were given special attention.

The following is an account of conditions existing in the various towns:

THOMPSON.

In the town of Thompson the nests were found to be present in about the same localities as last year, but in some instances were greater in number. At North Grosvenordale several small pear and apple orchards near the railroad station yielded 362 nests. Just west of Grosvenordale railroad station, on the top of the hill, 203 nests were cut from a clump of white oak trees near the roadside. One tree at this place was so badly decayed that it was necessary to cut it down, before the nests could be removed from its upper branches. In Thompson village the nests were scattered in territory around the four corners at Thompson Inn and on both sides of the road to the railroad station, to the number of thirty-one. On the estate of Norman B. Ream, nearby, where the infestation was first discovered, only four nests were found. On the farm of Howard Ingraham, half a mile north of the village, 156 nests were taken, mostly from one pear tree. At East Thompson, near the Rhode Island state line, sixty-one nests were found. At West Thompson ten nests; Mechanicsville, three; Thompson Station, two; Wilsonville, eight; Quinebaug, seven; and Quaddick, five. Scattering nests were taken throughout the entire township, except in the region around the northern end of Quaddick Reservoir,—bringing the total number for the entire town to 966 nests.

WOODSTOCK.

The conditions in the eastern part of the town were about the same as last year, but in the western part the nests were not nearly as numerous or scattered over as large an area. One nest was found near Davis' general store, at West Woodstock, but the remaining territory westward through Woodstock Valley and Kenyonville and northward to the Massachusetts state line was free from infestation. The orchards and scattered fruit trees in the eastern part of the town required much time for inspection and many nests were found in these places. At W. H. Young's, near South Woodstock, seventy-five nests were taken; at Bastow's, near Harrisville, sixty-five nests; while all fruit trees in this section contained one or more nests, to the total of 498, around South Woodstock. Along Main street, at Woodstock Hill across from the Academy, thirty nests were found; and back of the district school, eleven more. There were very few nests between Woodstock Hill and North Woodstock, four being taken at Echo Farm of L. H. Healey and six others scattered along in as many orchards; around the village of North Woodstock, ten nests; East Woodstock, eighty-three nests, mostly near the road, leading north over the hill. At

Sprucedale, near South Woodstock, twenty-seven nests were taken from trees around the factory there. Two nests were found in the section known as "English Neighborhood," two miles west of North Woodstock, and one other nest near Muddy Pond. In the entire town, 699 nests were found. While in Woodstock, the villages of Union, North Ashford, Eastford, Ashford and Phoenixville were scouted, together with the main roads which connected them, but no infestation was found at any of these places.

PUTNAM.

A great decrease was noted in the number of nests on each tree in the city of Putnam. Some of the trees which were covered with nests last year had only a few this year and the conditions throughout the city in general were much improved. In the territory between the city and the Rhode Island state line, however, especially along the main automobile road to Providence, the number of nests found was greater than last year. Along Elm street, and School street, in the city, were the worst infested places, one apple tree near the railroad station having seventy-three nests, while about seventy nests were cut from the large oak trees on Oak Hill, and forty-one nests from a pear tree at the corner of Elm and Bridge streets. Up through Rhodesville in the western part of the city the nests were not very numerous, or in the region beyond Oak Hill and Main street. At the Town Farm three nests were found; near the Children's Home, at East Putnam, thirty nests; near Day Memorial Hospital, one nest; Putnam Heights and vicinity, 105 nests and a few scattering ones near the Rhode Island state line, making a total of 1,260 nests for the entire town, where 5,989 were destroyed last year.

POMFRET.

Only a small part of Pomfret was found to be infested. The territory south of the New England Division of the railroad was free from nests as was that portion west of Pomfret Center. The worst infested spot was near Prospect Hill, on the stage road from Putnam, where sixty-three nests were cut from a small apple orchard beside the road. Six more scattering nests were found along this road nearer the Putnam town line. In the back yards along Pomfret street we took five scattering nests, one nest on an apple tree near Pomfret Academy and several more around the Clark estate. The nursery of J. H. Bowditch and Lapsley's large orchards, near the southern border of the town, were given special attention but no infestation was found in these places. A total of eighty-two nests were found in the entire town.

KILLINGLY.

In the town of Killingly several scattered infestations were found and these seemed to be the result of adults coming in from Putnam or from an infested portion of Rhode Island. One nest was found at Williamsville near the old grist mill, one at Dayville on Lake Side Farm, one on the loop road to Quinebaug River, one in the borough of Danielson at the corner of North and Main streets; three nests on the farm of Mrs. R. A. Bartlett, three miles north of Chestnut Hill; twelve nests on the Green Hollow road, two miles south of Danielson, on three connecting farms, and two nests one mile further south on the same road, near the Plainfield town line. Six nests were found in the vicinity of South Killingly in the southeast corner of the town. A total number of twenty-seven nests in the entire town.

BROOKLYN.

The infestation in Brooklyn was confined to the extreme eastern edge of the town. Twenty-eight nests were cut from a pear tree near Long Brook, two miles out from Danielson, on the main road to Brooklyn village. This pear tree was located within twenty feet of the house and the family residing therein had recently moved from the infested locality in Putnam. Along Allen Hill road, six scattered nests were found in the apple orchards connected with the farms. One other nest was found on the Brooklyn side of Wauregan village, in the southeast corner of the town, near the Catholic Church. There were no nests found in the village or in the western and northern parts of the town. A total of thirty-five nests in the entire town.

STERLING.

The town of Sterling was scouted from Killingly line as far south as the villages of Sterling and Oneco. The fact that the Providence Division of the railroad enters Connecticut through this section made it particularly liable to infestation. One nest was found in the village of North Sterling, about two miles west of the Rhode Island line. A total of one nest in the town of Sterling.

PLAINFIELD.

The town of Plainfield was scouted, except a section in the southeast corner of the town. The infestation was confined to the vicinity of Wauregan village, where six nests were found on the farm of Mrs. George Davis, on the hill east of the village; four nests on apple trees just below this point; two nests near the Wauregan railroad station on the road leading north, and one nest on the hill between the railroad station and the village. The villages of Moosup, Almyville, Plainfield, Plainfield Junction and Central Village were carefully scouted but no more nests were found. A total of thirteen nests for the town of Plainfield.

While in this section, the villages of Jewett City in the towns of Lisbon and Griswold, Canterbury in the town of Canterbury and the center of the city of Norwich were scouted but nothing was found.

WILLIMANTIC.

The city of Willimantic was scouted for brown-tail and gypsy moths as far as the city limits, but nothing in the nature of an infestation was found.

STAFFORD.

The villages in the town of Stafford were scouted for brown-tail and gypsy moths and to determine the western limit of the brown-tail infestation. One brown-tail nest was found near the Central Vermont railroad station and from the nature of its location the insect was probably brought down from infested territory in Massachusetts, through which the Central Vermont trains pass. The villages of Staffordville, Hydeville, Stafford Hollow, West Stafford and Orcuttville were carefully scouted but no other infestations were found. Total for town of Stafford, one nest.

SUMMARY.

The result of control work against the brown-tail moth during the past season indicates that the number of nests has been materially decreased throughout that portion of Connecticut known to be infested. The area actually infested has been slightly increased, due to finding a few nests in the adjoining towns of Brooklyn, Plainfield and Sterling, with one isolated specimen taken at Stafford. These towns, with the previous infested area, including Thompson, Woodstock, Putnam, Pomfret and Killingly, make a total of nine towns in the State where the brown-tail moth is known to be present.

The number of nests found and destroyed in each town are as follows: Thompson, 966; Woodstock, 699; Putnam, 1,260; Pomfret, 82; Killingly, 27; Brooklyn, 35; Sterling, 1; Plainfield, 13, and Stafford, 1; making a total of 3,084. Last year (1911) 7,133 nests were found in the territory infested at that time.

The Norwich Infestation.

After finishing the scouting work described above, specimens of the brown-tail moth were received on May 14th, 1912, from Mr. John E. Fanning, 31 Willow street, Norwich, Conn. On May 17th, Mr. Caffrey investigated the matter, and upon his arrival at Norwich, Mr. Fanning pointed out the places where he had observed the work of the insect.

After scouting the surroundings this infestation was found to be an isolated one, confined to a comparatively small space, about 100 yards in length, between Franklin and Chestnut streets, and a small connecting spot in two yards on Broadway, the next street to the westward.

The worst infested spot was at 170 Franklin street. Here three pear trees and one apple tree were partly defoliated. The owner of the property had been badly afflicted with the "brown-tail rash," caused by the poisonous and irritating hairs of the caterpillars, and had been forced to seek the services of a physician. The trees in the adjoining yard of D. S. Underwood were also defoliated, somewhat, the caterpillars at this time being very active and measuring about three-fourths of an inch in length. Further along, at 230 Franklin street, were a few nests on a group of eight pear trees, and caterpillars were feeding upon the foliage. At 258 Franklin street, one nest was found on a pear tree, and the caterpillars were feeding upon the trees nearby. At 89 Chestnut street, some feeding was noticed upon a pear tree.

Back of the Norwich Nickel and Brass Company's Factory, on Chestnut street, were two pear trees containing feeding caterpillars and three or four nests. At the corner of Broadway and Willow streets, on the property of Dr. W. J. Hanford, four nests were found on one pear tree, and on adjoining property, at 125 Broadway, the caterpillars from two nests were feeding on a pear tree.

Arrangements were at once made with Frank Kimball, who contracts for spraying operations in the locality, and the foliage of all the trees found to be infested with nests or caterpillars were sprayed with paste lead arsenate, five pounds to fifty gallons of water. Twenty-two trees were treated in this manner, care being taken to give them a thorough drenching with the poison. In addition to the points named above, and to the work done the previous winter, the trees along the following streets were examined for traces of the insect: Laurel Hill to top of the hill, Spruce, Talmond, Washington to the Parade Ground, Sachem, McKinley through Rockwell, Broad, Warren, Treadwell, Boswell, Cliff, Hobart, Hamlin, Central and North Main as far as Sixth, West Main to corner of Pine and Maple, Maple, Forrest, Cortot, Asylum, Pearl, Mt. Pleasant, Peck, West to first cross road, Uncas, Williams and Lafayette. An effort was made to examine a few trees in all parts of the city, as it was impossible at the time to cover the entire city systematically. The trees were in full leaf, which makes the insect difficult to detect, but no nests or signs of feeding were observed at any of the places, except where the spraying was done.

It seems probable that the brown-tail moth was in some way transported to Norwich from the towns known to be infested in the northeastern corner of the State, or possibly from the infested portion of Rhode Island.

A NEW SAWFLY PEST OF THE BLACKBERRY.

Pamphilius dentatus MacG.

By B. H. Walden.

Adult sawflies collected by the writer in a blackberry field in Hamden, near New Haven, May 24th, 1910, were sent to Professor Alexander D. MacGillivray, who pronounced them a new species, which he has recently described in the *Canadian Entomologist*, Vol. XLIV, p. 297, as *Pamphilius dentatus*.

When the field was again visited the following season, on June 27th, many sawfly larvæ were found, and the plants showed considerable evidence of their work. A number of these larvæ were taken to the laboratory but no adults were reared. An examination of other blackberry fields in the vicinity revealed no trace of the insect. In the spring of 1912, the place was again visited. The blackberry field where this insect was discovered two years previous had been plowed, but in two other fields nearby the insect was found and was especially abundant on one short row of blackberries near the field originally infested.

LIFE HISTORY AND HABITS.

The adults appear during the latter half of May, though in 1912, which was a late season, they were first observed on June 1st, were the most numerous June 9th, and the last adults were seen on June 14th.

The eggs are deposited in rows on the under side of the leaf, normally on the lateral veins, with the axis of the egg parallel with them, as is shown on plate II. Occasionally the eggs are fastened to the veins transversely, and very rarely are deposited on the leaf surface between the veins. No eggs could be found on June 1st, but many had been deposited by June 9th. A few larvæ were found on this latter date and all eggs had apparently hatched on June 25th. From fourteen to seventeen days are required for the larvæ to reach maturity, and by July 12th all but one or two had gone into the ground, where they remain until the following spring before pupating. Soon after hatching the young larva spins a few threads, by which it gradually draws a portion of the leaf over itself, forming more or less of a tube, within which it feeds. The larva travels ventral side up on the thin web thus formed, with its back to the leaf upon which it feeds. Where several eggs are on one leaf, the larvæ hatching from them collect together in one web, as the leaf is devoured. Other leaves may be drawn in with the first web and eaten, so all that remains of the leaves are the principal veins, each covered with a thin web, in which are bits of the leaves and castings from the larvæ. See plate.I.

The habits of this insect are quite similar to those of the peach sawfly, *Pamphilius persicum* MacG., an account of which was given in the report of this Station for 1907, page 285.

DESCRIPTION.

Egg. White, smooth and shiny; cylindrical, about twice as long as wide, ends round, sides usually straight, though occasionally slightly curved, or somewhat narrow towards the end. Average length, 1.59 mm.; average thickness, .67 mm.

Larva: *newly hatched.* General color, pearly white; head, black; the two basal joints of the antennæ, white; apical joint, black, and the remaining joints dark brown, with the front margins white. Length, 2.5 mm.; average thickness, .48 mm.; antennæ, .27 mm.; cerci, .29 mm. One larva, under observation, increased to 3.5 mm. in length before moulting, and the anal two-thirds of the body became pale green from the food consumed.

1st moult. General color, apical third, dirty yellow, remainder, pale green; head, amber-colored; eye-spots, light brown; a brown triangular spot at center of head; first segment back of head with a faint amber-colored, elongated transverse mark covering about two-thirds of the dorsal surface of the segment; anal plate with a broad, raised portion, starting near the tip, which diverges and becomes two-branched towards the base of the plate; the raised portion and edges of the plate nearly white; remainder, green; cerci with apical joint brownish. Length, 4.5 mm.

2d moult. Head, amber-colored; mouth parts, light brown; eye-spots, triangular mark on front of head and the elongated mark on first segment darker and more prominent than in preceding moulting stage; a dark median line from back of head to anal plate; markings on anal plate more strongly defined than above; cerci with apical, joint black; middle joint with base, dark; apical margin, white; basal joint, white. Length, 11 mm.; average thickness, 2 mm.

3d moult. Head, olive green. In this and the remaining moults the appearance is similar to that of the full grown larva.

Full grown larva. General color, bluish green; body, cylindrical, somewhat flattened and slightly tapering towards either end; legs, small and slender; head, from the front, nearly round, olive green, mottled and shiny; a dark brown spot near the center of the front at the point where the frontal sutures meet; eye-spots and mouth parts, brown; antennæ, seven-jointed; basal joint, white; apical joint, black; remaining joints, brown with the front margins white; the first segment back of the head with the raised portion brown, below which is a smaller brown spot; anal plate, broadly rounded with the lateral margins raised and with a broad, raised central portion starting at the tip and diverging near its middle into two branches which extend to the base of the plate; cerci, three-jointed; basal joint, broad and about equal in length to the two remaining joints; the first and second joints, white; the last joint, slender, tapering to a point and black in color. Length of larva, 17.5-19 mm.; average thickness, 3 mm.; width of head, 1.75 mm.; base of anal plate, 2.25 mm.

The dorsal and lateral views of the larva, as well as dorsal and ventral aspect of the anal plate and the front of the head, are shown on plate III.

The pupa was not obtained.

Adult. The adult is a moderately large and striking sawfly, somewhat resembling *P. persicum*, but differing from that species in the color of the antennæ, the basal portion of which are black with the remainder white. The tibiæ of the hind legs are black. In *P. persicum* the antennæ are black to the tips and the tibiæ of the hind legs are rufous. See plate III, b.

The facial markings of the female are similar in both species, but differ considerably in the males. The males of *P. dentatus* have the entire face (declivous area) yellow, while that of *P. persicum* has the lower half and margins of eyes yellow with the remainder black.

This species was described by Professor A. D. MacGillivray in the October issue of the *Canadian Entomologist*, Vol. XLIV, page 297, 1912, as follows:

"*Pamphilius dentatus* n. sp.—Body black, with the terminal half of the antennæ, the clypeus, a dentate spot on the inner orbits extended as a parenthesis-shaped mark to the caudal aspect of the head; an emarginate spot in front of the median ocellus and an angular line behind it, a parenthesis-shaped mark at the lateral margin of the vertical furrow, the margin of the pronotum, the tegulae, the V-spot, the scutellum, the postscutellum, a spot on the humeral angle beneath the wings, the front and middle legs and the hind legs except the tibiæ, white; the abdomen rufous beyond the basal plates; antennæ with about twenty-seven segments; supraclypeal area carinated; head depressed about the median ocellus, sparsely punctured; declivous area smooth; median lobe of mesothorax smooth, lateral lobes densely punctured and scutellum sparsely punctured; wings hyaline; veins brownish. Length 8-10 mm.

The male differs in having the entire declivous area yellow and the notum, except the scutellum and the postscutellum, black.

Habitat.—Wilbraham, Mass.; J. O. Martin, collector. Hamden, New Haven and Wallingford, Conn.; B. H. Walden, collector.

This species is near *rubi* Rohwer."

Whether or not this insect will prove a serious pest of blackberries is impossible to state at this time. Most of the feeding takes place on the lower leaves, and very few of the canes in the infested fields were completely defoliated. On the other hand the insect has spread over a considerable area in the past two seasons.

No remedies were tried against the blackberry sawfly, but should it become abundant, spraying the foliage, about the time the eggs are deposited, with lead arsenate at the rate of two pounds in fifty gallons of water, will probably control it.

The blackberry sawfly was not observed feeding on any other species of plant, though both black and red raspberries were grown adjoining one of the blackberry fields where the sawfly was found.

THE LIFE HISTORY AND HABITS OF THE WALNUT WEEVIL OR CURCULIO.

Conotrachelus juglandis, Lec.

By W. E. Britton and H. B. Kirk.

The studies herein described were undertaken for the purpose of learning the life history, habits and seasonal development of this weevil, about which little has heretofore been known, although it was described[1] thirty-five years ago.

The senior author first became interested in this insect through Dr. Robert T. Morris, a well-known surgeon of New York City, who has a farm at Stamford, Conn., and who is an enthusiastic nut grower, and president of The Northern Nut Growers' Association. Dr. Morris has been experimenting for a number of years trying to establish the hardier varieties of commercial nut-bearing trees, with the idea of introducing the new and interesting industry of nut-growing into the New England States.

Since the spring of 1909 this department has received a number of letters from Dr. Morris, regarding an insect which punctures the nuts of several species of walnuts, and another (a bud-worm) working in the new growth of the same trees. Later, we received letters stating that he had observed weevils puncturing the nuts and had found the larvæ of some insect working in the stems. In July, 1909, Dr. Morris sent specimens of this weevil, which was identified as *Conotrachelus juglandis* Lec.

It was Dr. Morris who suggested that the Station detail someone to study the walnut weevil. Realizing the importance of the subject, Mr. Kirk was engaged as an assistant with the understanding that such investigations were to be part of his work.

The field studies were made on the premises of Dr. Morris at Stamford, and of Mr. H. L. Champlain at Lyme, supplemented by observations upon such other walnut trees as could be found growing elsewhere about the State.

The general plan of these studies and the present paper are the joint work of the authors. Mr. Kirk has done most of the field work.

The authors hereby acknowledge their indebtedness to Dr. Robert T. Morris and to Mr. H. L. Champlain, who kindly placed their trees at our disposal for study and experiment; to the Bureau of Entomology for identifying specimens and furnishing records; and to many museums and entomologists throughout the country for kindly sending us records from their specimens.

PREVIOUS KNOWLEDGE OF THE WALNUT WEEVIL.

In searching the literature and in corresponding with the Bureau of Entomology and with various entomologists, it was evident that little was known about the life, history and habits of this species. B. D. Walsh, the first State Entomologist of Illinois, evidently observed the walnut weevil as early as 1867, but regarded it as a "Phytophagic species" of the common plum curculio. In his first report he states*:—

> "But there, actually, in my opinion, does exist a 'Phytophagic species' of the common curculio, which is uniformly one-half larger and which

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* Walsh, Report on the Noxious Insects of Illinois, I, p. 86, 1868.

in the larva state feeds, not upon stone-fruit or pip-fruit, but upon green butternuts and walnuts (*Juglans*), from the former of which I bred two individuals, August 13th. Of this peculiar type of curculio I sent specimens six years ago to our great North American authority in the Order of Beetles, Dr. J. L. LeConte; and he pronounced them to be mere varieties of the plum curculio. They scarcely differ from that insect in any other perfectly constant character than size."

In a foot note on the same page he explains:—

"There is, I believe, a slight, but perfectly constant colorational character by which these two forms are distinguishable. The broad band behind the polished black humps on the wing-cases is, in the large-sized nut-inhabiting form, of a dingy white color with a few milk-white spots. In the small plum-inhabiting form, this same band is of a bright ochre-yellow color, with more or less milk-white spots, which last, however, never occupy more than one-half of the ochre-yellow band. Moreover, I am informed by Dr. Hull, that the larva of the large-sized form—with which he has long been familiar—occurs with him in hickory-nuts having their shucks marked by the characteristic crescent-slit, and that this larva 'penetrates to the kernel of the nut.' Whereas, as is well known, the larva of the small-sized form that frequents the plum, never under any circumstances penetrates to the kernel of that fruit. This difference in the habits of the two forms is certainly very remarkable."

Mr. Walsh quotes Dr. Fitch to the effect that specimens found on butternut trees are always larger than those from fruit trees, the difference in size being ascribed, by Dr. Fitch, to the greater food supply.

In 1876 the walnut weevil was described as *Conotrachelus juglandis** by Dr. J. L. LeConte. Since that date the insect has been mentioned several times in the literature, but only as breeding in the nuts. Thus, Brooks, writing in 1910,† describes and illustrates the injury to the nuts by the adults and larvæ of this insect. Dr. F. H. Chittenden, of the Bureau of Entomology, in a letter to the senior author, as late as June 10th, 1911, states:

"This species has never been given careful study to my knowledge, and I have never had an opportunity of testing any remedy against it. I am familiar with its habits, however, having studied it when at Ithaca,

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* LeConte, Proc. Am. Phil. Society, Vol. XV, p. 226, 1876.

† Brooks, West Virginia Agricultural Experiment Station, Bull. 128, p. 176, 1910.

N. Y., and found that the larva develops chiefly from the nuts of the walnut."

The first intimation that the insect breeds also in walnut stems came to us from Dr. Morris, who, in July, 1909, sent to this office specimens which he had observed "apparently at work upon a young shoot of *Juglans regia*." In July, 1911, he sent more specimens and wrote as follows:

> "You speak of the injury to the fruit. That is not where the great damage is done. Eggs are laid in the leaf axils, beginning just as soon as the leaves appear. Later eggs are laid also in the stems of the leaves, and later yet in the fruit. Some of my young trees are all but ruined already. It is a terrible pest. The Japanese walnuts, *Juglans sieboldiana* and *J. cordiformis*, are their favorites, then comes the English walnuts, *J. regia*. The chief local tree for attack is the butternut, *J. cinerea*."

In August of the same year Mr. A. B. Champlain, then an assistant in this department, discovered larvæ working in the new growth of *J. sieboldiana* at Lyme, Conn., and brought samples to the Station insectary, where he bred the adults of *Conotrachelus juglandis*, this being the first definite record of the species being bred from the stems.

INJURY AND ABUNDANCE.

In Connecticut the injury caused by the adults and larvæ is confined entirely to the new growth and nuts, causing the stems, in extreme cases, to be killed entirely back to the old wood and causing the nuts to fall off before maturing.

The adults do their chief damage early in the spring, making large punctures (see plate IV, a), some of which cut half way through the leaf stems and young shoots, causing them to wilt and die, and although the main injury is done by the larvæ, the adult injury would be worth considering.

The larvæ work first in the young shoots and, later, as the stems grow, in the petioles of the leaves, in the leaf stems, or, in fact, any part of the new growth large enough to accommodate the larvæ. This injury to the new shoots by the larvæ, most severe in early summer and up to the middle of June, has been so great in the plantations of Dr. Morris at Stamford and also with the trees at Lyme, as to wholly prevent the owners from obtaining a crop of nuts. Plate IV, b, shows the injury caused by the larvæ.

Juglans sieboldiana and *J. cordiformis* seem to be the ones preferred, and we have counted as many as eight larvæ in a stem four inches long, and have seen trees where every stem was completely tunneled out. The work can be detected by the egg puncture and by the frass which is pushed out through it as the larva grows.

From what we can learn through correspondence with other entomologists and nut growers, the damage caused by this insect is far more serious in Connecticut than in most other states. The fact that it is mentioned as breeding only in the nuts, and has not previously been recorded as attacking the new growth, would lead one to believe that it has not been very abundant, nor has caused much damage in other regions where nuts are grown.

The larvæ cause considerable injury to small trees in nurseries. For instance, in a nursery at New Haven, in August, out of forty-six three-year-old trees of *Juglans sieboldiana* and *J. cordiformis*, twenty-six were infested, some of them badly, by the larvæ tunneling in the new growth. On October 10th, the junior author examined thirty-five six-year-old trees of *J. sieboldiana* in another part of this nursery. Five trees showed larval attack but most of the year's growth was short and not vigorous, and consequently not favorable for the attack of this insect. In the same nursery, there had been considerable fall feeding at the base of the leaf petioles by the newly-emerged adults, but no beetles could be found on the trees nor underneath the stones upon the ground nearby.

In a nursery at New Canaan, about the middle of September, Mr. Kirk noticed a row containing about 265 trees of *Juglans sieboldiana* on all of which the larvæ were tunneling in the new growth. An adjoining row of about the same number of *J. regia* trees was only slightly attacked, and another adjoining row containing about 400 trees of black walnut, *J. nigra*, were uninfested. Several hundred other trees of *J. sieboldiana* in another part of the same nursery were badly infested, not a single tree escaping. Here, also, was noticed the fall attacks of the adults at the base of the leaf petioles, and two adults were collected.

What appeared to be the work of this weevil was received from Litchfield July 7th, and showed the characteristic feeding punctures at the base of the leaf stem.

LIFE HISTORY AND HABITS.

This insect has only one generation each year and passes the winter in the adult stage, though we were not able to discover the exact place of hibernation.

The beetles appear usually the latter part of May, and begin at once to feed upon the stems and leaf veins. After mating, the females begin about the last week in May to lay eggs. Apparently the beetles feed throughout the egg-laying period, as both collected and bred adults died within one or two days when left in captivity without food, but when given food they lived for a month. The beetles have the habit common to most curculios of feigning death and dropping from the stems when disturbed.

The eggs are laid on both fruit and stems in irregular crescent-shaped punctures and under flaps, similar to those of the plum curculio, *C. nenuphar,* and hatch from six to twelve days later, depending probably upon weather conditions. Eggs are laid throughout the period extending from the last week in May up to the first of August. Those laid after about July 20th hatch, but do not mature, the larvæ dying in the stems, probably because of the hardening of the plant tissues. During August many dead larvæ were observed in the stems, but no living larvæ were seen after September 1st.

The young larvæ first attack the young shoots, then the base of the leaf stems, then with some species of *Juglans* the other portion of the leaf stem is injured and finally the nuts. In the stems they work mostly upwards but are found tunneling in both directions. The moults were not observed. From one to five larvæ to each nut have been observed in butternuts, where they go into the kernel but return to the shucks to complete their larval life. From four to six weeks are required for the larval development, which does not continue in the stems after September 1st.

When mature, the larvæ enter the ground about one inch below the surface, remain there about ten days, when they pupate. From sixteen to twenty days after pupating the adults emerge and, flying to the trees, eat small holes, chiefly at the base of the leaf petioles.

The feeding habits of the newly-emerged adults might easily mislead one to conclude that the beetles were ovipositing. The first pupæ are seen about August 1st, and the last adults are seen about September 16th. Our latest record of adults which had laid eggs earlier in the season was September 7th.

Dr. Morris informs us that he had observed adults at work on the trees as early as May 7th and as late as September 5th.

DESCRIPTION.

Egg. The egg is oblong oval in shape and of a creamy white color and apparently with a smooth surface, but when examined, under high power, it has a finely wrinkled appearance. Length, .95 mm.; thickness, .57 mm.

Larva. The larvæ are cylindrical and legless with no prominent markings or appendages. When young they are of a dirty white color with brown heads, and when mature the body changes to a yellowish white color. Tips of mandibles black, prothoracic segment with a brown patch nearest the head, and tubercles brown. Length of full grown larva, 12 mm.; thickness, 3½ mm.

Pupa. There is no pupal cell, the pupa being entirely naked. It is of the same general form and size of the adult and of the same yellowish white color of the full grown larva. There are a few long, slender, brown hairs on the beak, thorax and ventral side of the abdomen and two on each femur, with two prominent stouter spines on the last abdominal segment.

Adult. The adult very closely resembles the plum-curculio, *C. nenuphar,* but is readily distinguished by its larger size and the more distinct, broad, whitish band on the elytra. The beak is about one-half and the thorax one-third as long as the body. The elytra have several humps and ridges which give the beetle a rough appearance. The whole is covered with short, yellowish hairs, forming the bands on the thorax and elytra. The newly-emerged specimens are distinctly brownish in tint, but after a time turn to a darker grey color. This serves to distinguish the newly-emerged from the egg-laying adults. The length of *C. juglandis* varies from .24 to .28 of an inch, while that of *nenuphar* does not exceed .22 of an inch.

This weevil was originally described by Dr. J. L. LeConte in Proceedings of the American Philosophical Society, Vol. XV, page 226, 1876, as follows:

C. juglandis n. sp.

"Dark brown, varies with black, pubescence fulvous, or dirty yellow, forming a curved bifurcated line each side of the prothorax, and a broad band behind the middle of the elytra. Beak longer than the head and prothorax, cylindrical, not stout, shining, sparsely punctured, with a broad lateral groove, and two stout, finer ones near the base. Prothorax coarsely punctured and rugose, with a very short carina before the middle, and four discoidal tubercles; broadly constricted in front. Elytra with striæ with large quadrate punctures, alternate interspaces strongly costate, the third and fifth interrupted forming on each a high crest, with a basal and sub-apical elevation. Ventral segments sparsely punctured, fifth more finely and densely. Legs somewhat annulated, thighs bidentate. Length, 7 mm.; .27 inches.

This species is closely allied to the plum weevil, *C. nenuphar*, and has been confounded with it until the present time. It is, however, much larger, the beak is longer, more slender, and less curved; the prothorax is broader and more rounded on the sides, the crest of the fifth elytral interspace is longer, almost as large as that of the third, and overlaps it far more than half its length, and, finally, the pubescence is of a nearly uniform color, so that the band of the elytra is not variegated with white. The ventral segments are much less densely punctured."

FOOD PLANTS.

From our studies and observations, it is evident that in Connecticut the walnut weevil attacks and injures the various species of *Juglans* in the following order, those at the head of the list being most seriously injured.

Juglans cordiformis,	Heartnut,	Fruit and Stems.
" *sieboldiana,*	Siebold's walnut,	" " "
" *cinerea,*	Butternut,	" " "
" *regia,*	Persian or English walnut,	" " "
" *nigra,*	Black walnut,	Stems.
" *mandshurica,*	Japanese walnut,	"

Though we have no definite records of this weevil attacking and injuring the hickories, Mr. Kirk observed punctures at the base of the leaf stems resembling closely the feeding punctures of *C. juglandis* on *Juglans*. Dr. Morris states that he has seen them on the bitternut, *Hicoria minima,* the shellbark, *H. ovata,* and the mockernut, *H. alba.* No doubt they may attack the stems of certain hickories, and the stems and nuts of practically all species of *Juglans,* yet they seem to prefer and only injure a few species of the latter.

EXPERIMENTS IN DETERMINING LIFE STAGES AND HABITS.

Adults were placed in cages made of cheese cloth sewed into a cylinder-shaped bag and slipped over the new growth and tied at both ends, to determine the habits of the adults.

The weevils were collected from the neighboring trees, immediately placed in the cheese cloth cages and were examined twice or three times a week. The adults did considerable feeding before making the egg puncture, by stripping the bark on the leaf veins and stems to such an extent that we thought it advisable to try an arsenical poison to kill them before ovipositing.

The egg and pupa stages were studied in the Station insectary. The length of the egg stage was determined by cutting off the shoots immediately after eggs were laid, and taking them to the insectary, where they were kept fresh and were examined each day until the eggs hatched.

The larvæ were studied in the field in both the stems and the nuts. Stems were marked and labeled where eggs had just hatched and the cheese cloth bags were tied over the stems to trap the larvæ when they emerged, giving the length of the larval stage. Larvæ were taken from these cages and placed in cages in the insectary, where the pupa stage and time of adults emerging were determined.

The habits of the newly-emerged beetles were studied in the field.

CONTROL METHODS.

After observing the extensive feeding habits of the adults, we were able to ascertain a probable preventive in the use of lead arsenate. Several small trees were sprayed with lead arsenate, six pounds to fifty gallons, and weevils were collected and encaged on the sprayed stems.

On June 11th, three cages were made on a tree sprayed with the above proportions; two cages containing two weevils each and the other, four weevils. Check cages were made on unsprayed trees. By June 18th all the weevils were dead in the cages and no eggs were laid and all stems showed the characteristic feeding marks of the adults. In the unsprayed cage one weevil was dead by the 18th, while the other fed and oviposited until July 9th.

At Lyme, Conn., June 21st, two other cages were made, with three weevils each, on a Japanese walnut tree in bearing, sprayed with the same proportions of lead arsenate; two eggs were laid the following day, but the weevils were found dead a week later and there were no more punctures. The trees were examined later (August 10th) with the result that no more punctures were made after the trees were sprayed, although weevil work was apparent from eggs which had been laid before the application. Four adjoining trees showed considerable weevil injury and larvæ were still working in stems and nuts, while in the tree sprayed no larvæ were found.

Several other tests were made on a black walnut tree on the Station grounds, with similar results.

In one nursery, cutting off the infested shoots in mid-summer, say about June 20th, is practiced. The tree afterwards makes a good growth and the shoots are not seriously injured by the weevils, late in the season.

This pruning must not be done too late, however, else the new growth will not ripen sufficiently and will be winter-killed.

In any spraying work to control the walnut weevil, the spray should be directed against the under surface of the leaves in order to kill as many as possible of the adults which feed there on the leaf veins.

Distribution in North America.

Apparently this weevil occurs at least throughout the eastern half of the United States and Canada, though in a large portion of this territory it is not abundant and is not considered an important pest. In order to obtain definite records of its occurrence some sixty letters were sent to specialists, station and museum entomologists, horticulturists and nut growers, asking for the records on the specimens in their collections and for the results of their field observations regarding this insect. About fifty-one replies were received, from which the following records of distribution are compiled. The names given are in most cases not those of the collector, but of those reporting the records to us.

ALABAMA: Andalusia (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
CANADA: Belleville, Ont. (coll. of J. D. Evans, Trenton, Ont.).
  Hamilton, Ont., Ridgeway, Ont. (Ont. Agr. College coll., Guelph, Ont., C. J. S. Bethune).
  Montreal (Colo. Expt. Sta. coll., Ft. Collins, Colo., C. P. Gillette).
  Mount St. Hilaire, Mont. (coll. G. Chagnon).
  Ontario (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
  Ottawa (coll. of W. H. Harrington, Ottawa, Can., A. Gibson).
  Ridgeway, Ont. (coll. of J. D. Evans, Trenton, Ont.).
  Laval County (Can. Dept. Agr. coll., Ottawa, Can., A. Gibson).
  Toronto, Ont. (Cornell Univ. coll., Ithaca, N. Y., G. W. Herrick).
CONNECTICUT: Lyme (coll. of A. B. Champlain, Harrisburg, Pa.).
  Lyme (Conn. Expt. Sta. coll., New Haven, Conn.; collected by A. B. Champlain and H. B. Kirk).
  New Canaan (Conn. Expt. Sta. coll.; collected by B. H. Walden).
  North Branford (Conn. Expt. Sta. coll.; collected by H. B. Kirk).
  Stamford (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
  Stamford (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
  Stamford (Conn. Expt. Sta. coll.; collected by H. B. Kirk).
  Stamford (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
DISTRICT OF COLUMBIA: Washington (U. S. Nat. Mus. coll., E. A. Schwarz. Listed by Ulke).
  Washington (Ohio State Univ. coll., Columbus, O., H. Osborn).
GEORGIA: Clayton (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
  Santa Catherina Island (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
ILLINOIS: Galesburg (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
  Central Illinois (observed by H. Garman).
  Northern Illinois (Ill. Expt. Sta. coll., Urbana, Ill., C. A. Hart).
  Illinois (mentioned by B. D. Walsh).
INDIANA: Elkhart (Mich. Expt. Sta. coll., East Lansing, G. D. Shafer).
  Harrison County (Ind. Expt. Sta. coll., Lafayette, Ind., J. Troop).
  Posey County (Ind. Expt. Sta. coll., Lafayette, Ind., J. Troop).
  Southern Indiana (Ind. Expt. Sta. coll., Lafayette, Ind., J. Troop).
IOWA: Guttenberg (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
  Iowa (Mus. Comp. Zool. coll., Cambridge, Mass., S. Henshaw).
KANSAS: Douglas County (Univ. of Kan. coll., Lawrence, Kan., S. J. Hunter).
LOUISIANA: Mound (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
MARYLAND: Plummer's Island (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
  Maryland (Minn. Expt. Sta. coll., St. Anthony Park, Minn., A. G. Ruggles).
MASSACHUSETTS: Mass. (coll. of H. C. Fall, Pasadena, Cal.).
NEBRASKA: (Indications but no definite record, L. Bruner).

NEW JERSEY: Newark (N. J. Expt. Sta. coll., New Brunswick, N. J., H. B. Weiss).
Orange Mts. (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
South Orange (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
New Jersey (Mus. Comp. Zool. coll., Cambridge, Mass., S. Henshaw).
NEW YORK: Buffalo (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
Buffalo (Univ. of Kan. coll., Lawrence, Kan., S. J. Hunter).
Ft. Montgomery (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
Newport (New York State Mus. coll., Albany, D. B. Young).
New York City (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
*New York City (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
Peekskill (Cornell Expt. Sta. coll., Ithaca, N. Y., G. W. Herrick).
Phoenicia (N. Y. State Mus. coll., Albany, N. Y., D. B. Young).
Poughkeepsie (N. Y. State Mus. coll., Albany, N. Y., D. B. Young).
Westchester (Injury observed by W. C. Deming).
New York (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
New York (Am. Ent. Soc. coll., Phila., Pa., H. Skinner).
New York (coll. of H. C. Fall, Pasadena, Cal.).
New York (Mich. Expt. Sta. coll., East Lansing, G. D. Shafer).
NORTH CAROLINA: Magnetic City (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
Round Knob (U. S. Nat. Mus. coll., Wash., D. C., W. D. Pierce).
North Carolina (Mich. Expt. Sta. coll., East Lansing, G. D. Shafer).
OHIO: Cincinnati (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
Sugar Grove (Expt. Sta. coll., Wooster, O., H. A. Gossard).
PENNSYLVANIA: Allegheny (Ill. Expt. Sta. coll., Urbana, Ill., C. A. Hart).
Allegheny (Mus. Comp. Zool. coll., Cambridge, Mass., S. Henshaw).
Allegheny (Am. Mus. Nat. Hist. coll., N. Y. City, C. W. Leng).
Bethlehem (Lab. Econ. Zool. coll., Harrisburg, Pa., A. B. Champlain).
Harrisburg (Lab. Econ. Zool. coll., Harrisburg, Pa., A. B. Champlain).
Jeanette (reported by Mr. Klages).
Pittsburg (reported by Mr. Klages).
Pottstown (Wagner Inst. coll., Phila., Pa., A. B. Champlain).
Winewood (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
Dauphin County (reported by Dr. Castle).
Lancaster County (reported by Dr. Castle).
Penn., Southwestern (reported by Dr. John Hamilton).
Penn. (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
TEXAS: Texas (Mich. Expt. Sta. coll., East Lansing, Mich., G. D. Shafer).

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* These specimens were collected by Dr. R. T. Morris and may have been taken on his farm at Stamford, Conn.

VERMONT: Burlington (Boston Soc. Nat. Hist. coll., Boston, Mass., C. W. Johnson).

VIRGINIA: Hume (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
  Pennington Gap (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
  Petersburg (Bur. Ent. coll., Wash., D. C., A. L. Quaintance).
  Virginia, Southwestern (observed by W. J. Price).
  Virginia (Am. Ent. Soc. coll., Phila., Pa., H. Skinner).

WEST VIRGINIA: Berkeley (U. S. Nat. Mus. coll., Wash., D. C., E. A. Schwarz).
  French Creek (Expt. Sta. coll., Morgantown, W. Va., W. E. Rumsey).

WISCONSIN: Wis. (N. Y. Expt. Sta. coll., Geneva, N. Y., P. J. Parrott).
  Wis. (Mus. Comp. Zool. coll., Cambridge, Mass., S. Henshaw).

Many experiment station collections contain no specimens of the walnut weevil. A few have material from their own state. Others have specimens from adjacent or distant states, and the existence of such specimens is frequently unknown to the entomologists now working in the states where the beetles were collected. We mention this to show that in all probability this weevil is not as abundant throughout the range of *Juglans* as in Connecticut, or it would have been collected more extensively, and had it caused much damage it would probably have been studied elsewhere.

Several entomologists and collectors report no records for their states, but such data were furnished by others.

Reports were received from Professors A. J. Cook, R. W. Doane, and H. C. Fall, California; Professor C. P. Gillette, Colorado; Professor C. O. Houghton, Delaware; Dr. E. W. Berger and Professor J. R. Watson, Florida; Professor J. M. Aldrich, Idaho; Professor H. Garman, Kentucky; Dr. Edith M. Patch, Maine; Geo. D. Shafer, Michigan; A. G. Ruggles, Minnesota; Professor Leonard Haseman, Missouri; Professor R. A. Cooley, Montana; Professor W. C. O'Kane, New Hampshire; Professor C. E. Sanborn, Oklahoma; Professor A. B. Cordley, Oregon, and Professor A. L. Melander, Washington; but there are no records or observations to indicate that *Conotrachelus juglandis* occurs in these states. No reports have been received from Arizona, Arkansas, Mississippi, Nevada, New Mexico, North Dakota, Rhode Island, South Carolina, South Dakota, Tennessee, Utah and Wyoming.

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THE WALNUT BUD-MOTH.

Acrobasis caryæ Grote?

By H. B. Kirk.

While studying the walnut weevil on the plantation of Dr. Robert T. Morris at Stamford (see page 240) nests of lepidopterous larvæ were noticed on the tips of the branches of Persian walnut, *Juglans regia,* trees. Closer examination revealed larvæ tunneling in the buds and new shoots and causing about as much damage as the weevil itself.

This insect was observed more than three years ago by Dr. Morris, who wrote in July, 1909, as follows:

> "By the way, I will enclose some newly discovered bud-worm work and of very serious character, as it comes at a season when my men are not looking out for bud-worms. I send under separate cover three shoots from a young *Juglans regia* (the only shoots which it had) all headed off by the bud-worm. In May the bud-worms badly injured *Juglans cordiformis, J. sieboldiana, J. australis, J. mandshurica, J. regia, J. nigra, J. rupestris,* and *J. Californica:* also *Hicoria ovata, H. laciniosa,*

H. pecan and several hybrids. They are particularly fond of *J. cordiformis*. Some trees of this species five years old and about ten feet high had practically every terminal bud infested this spring."

A month later Dr. Morris wrote:

"Under separate cover I am sending specimens of *Juglans cordiformis* showing work of a new lot of bud-worms. This makes the third brood apparently for this season, if all are of the same species. Bud-worms are going to do terrible damage among my thousands of young nut trees."

In 1911 Dr. Morris regarded the bud-worms as the larvæ of the walnut weevil, *Conotrachelus juglandis,* therefore his statement regarding damage should be modified, as some of the injury to the various species of walnut and hickory about which he wrote in 1909 was undoubtedly caused by the weevil instead of the bud-worm. In the studies herein described, the Persian walnut, *J. regia,* was more seriously injured than any other species observed.

EXTENT OF INJURY.

The damage done by this insect, shown on plate VIII, is fully as great as that of the weevil itself, and although there are not as many species of trees affected, the most valuable species, *J. regia,* is the one preferred. In our observations on Dr. Morris' farm the damage to the above species of walnut has been greater than that of *C. juglandis,* and in a number of cases has killed the young trees in a very short time.

The young butternuts, black walnuts and several varieties of the English or Persian walnuts, *J. regia,* were also damaged seriously. On one tree, two feet high, thirty-five pupæ were found in the nests. This tree and several others not so badly infested were killed. So far as can be determined, it does not attack, or at least does not seriously injure, any of the other species of *Juglans.*

This insect has been studied and observed only at Stamford, though indications of its presence were noticed late in the season at New Canaan.

HABITS AND LIFE HISTORY.

There are at least three generations each season. The eggs are laid singly around the base of the bud and sometimes on the leaves, are not concealed and, though small, can easily be detected on infested trees. The first brood was not discovered until in the pupa stage, when an idea of the damage was first brought to our attention.

Adults that were bred June 28th from these pupæ laid eggs two days later. These eggs hatched in from six to ten days. Calculating from the period necessary for the development of the second brood, the first eggs are laid about the second week in May. Eggs of the third brood are laid about August 15th to 22d. When the larvæ of the third brood were first discovered (August 23d) they were about an eighth of an inch in length, and when examined September 7th, they were found in the old nests of the previous brood and apparently had not increased in size. No observations were made after this date, but the young larvæ probably pass the winter in the old nests.

The larval habits of this insect are quite varied, feeding on the buds, leaves, and stems. The stem-feeding habit is most peculiar; sometimes the feeding is from the outside and only on one side of the stem, while again the larva begins on the terminal or an axillary bud and commences feeding downward, being entirely concealed all the while.

On account of this latter habit the work of this species and that of the walnut weevil was at first thought to be caused by one species of insect. But even with this similarity, the work of the two species can readily be distinguished. The larva of the walnut weevil exudes its frass by pushing it out from the egg punctures at the base of the petioles or along the stem, but never at the terminal end of the new shoot. In the work of the present species the tips of the shoots die and the frass is retained and afterward forms a part of the pupal case, and again the nests are always apparent with the frass and leaves drawn together where the majority of the pupal cases are found.

The nest, which is the most conspicuous evidence of the presence of this insect, contains most of the pupæ. The remaining few are found in the dried tips of the stems or in the green stem itself. From two to three weeks after pupating the adults emerge.

Adults, bred in the laboratory, laid eggs several days after emerging and died shortly after. The egg and adult stages of this insect are shown on plate IX.

IDENTITY OF THE BUD-MOTH.

Several fresh-reared adults were submitted to Mr. Charles R. Ely of Washington, D. C., a specialist in this group. Mr. Ely, on first examination, considered this a new species, and remarked that, according to his memory, the pupa cases were quite different from those of *Acrobasis caryæ* Grote, to which the adults bore a close resemblance. It is recognized that in the genus *Acrobasis* adults of certain species can be separated only by a knowledge of the food habits of their larvæ.

Mr. Ely afterward examined the material in the U. S. National Museum and, in company with Dr. H. G. Dyar, compared our specimens with those labeled *A. caryæ* Grote in the collections. They seemed to be identical. Mr. Ely states, however, that the specimens in the museum are not really proved specimens of *A. caryæ* as their larval habits are not known, and furthermore that the adults appear different from the others which were bred from pecan. For the present, therefore, we must refer to this bud-worm of the walnut as *A. caryæ* Grote, but on further investigation it may prove to be an undescribed species.

DESCRIPTION.

Egg. Irregularly oval, greenish white, surface finely wrinkled, .57 mm. long and .34 mm. wide.

Larva. The larva is cylindrical, tapering slightly toward both ends, and is sparsely covered with long hairs. There are no prominent markings; tubercles indistinct. Mouth parts and body of a dirty olive green color, head shining black and on the dorsal side of the first segment is a black patch with a smaller black spot on either side, the larger patch being divided in the middle by a line the same color as the body. Second segment marked with two small black dots; legs in front, black. Length, five-eighths of an inch; thickness, one-eighth of an inch.

Pupa. About seven-sixteenths of an inch in length, distinctly tapering. Light brown in color with no striking markings. Anal extremity with a short, sharp spine on either side pointing outward and four slender hooked spines at posterior end. Abdominal segments finely and moderately densely punctured.

The pupa is enclosed in a cylindrical-shaped case about one-half inch long and about three-sixteenths of an inch in diameter.

It is composed chiefly of frass of the larva. Sometimes a number of cases are welded together in one mass, but the general shape is the same.

Adult. The adult is a grey moth having a wing-expanse of about three-fourths of an inch but showing much variation in size. The primaries are ash-grey or darker, with lighter basal areas and a light grey suffused area on distal third of front margin extending scarcely half-way across the wings, more or less iridescent. Secondaries unicolorous and in most cases lighter than the primaries.

Acrobasis caryæ, which is probably identical with the walnut bud-moth, was originally described by A. R. Grote in *Papilio,* Vol. I, page 13, February, 1881. The description is reprinted here, and is as follows:

Acrobasis caryæ n. s.

"Male. The maxillary palpi untufted, the antennæ ciliate, with a sub-basal flexure and a scale-tooth on the thickly scaled basal joint. Shining grayish fuscous; the head and thorax concolorous. Smaller than *Angusella,* without the carneous shadings and reddish thorax and head. Outer line of primaries pale, narrow and faint. Inner line a ridge of raised darker scales narrowly edged outwardly by a pale, flesh-colored shade. The wing is paler, more grayish, at base. The color shifts with the light. Discal points faint. In ornamentation this species is inconspicuous. Hind wings, as usual, blackish; fringes interlined, concolorous. Length of primary wing, 9 mil. Reared by Mr. Coquillett from larvæ on *Carya porcina;* the larva has been found 'boring into the twigs.'"

Mr. Coquillett describes the larva and chrysalis as follows:

"Body subcylindrical, smooth, pale greenish ash; a pale brown subdorsal dot on each side of segment 2; a wavy-fold below the spiracles; the latter are encircled with a dark brown ring, and there is a brown piliferous dot above each; a few whitish hairs on each side of the body; top of segment 1 polished, yellowish green; head narrower than segment 1, heart-shaped, dark brown; venter pale green, unmarked; 16 legs; length 14 mm. Found May 21, burrowing in the branches of the pignut hickory, *Carya porcina,* usually selecting the lower branches; imagoes about June 22.

Chrysalis. Of the usual form, pale brown, rounded at the posterior end, at which place there is a cluster of about four slender hooked spines; length, from 7 to 8 mm. The larva spins a thin web around the footstalks of the leaves which grow near the terminal end of the branch, and then burrows into the terminal bud and the wood of the present year's growth. It webs its castings together and forms a short tube which projects outward from the mouth of its burrow, and is closed at the outer end. The larva probably assumes the chrysalis form in its burrow, but those which I reared deserted their burrows and spun tough cocoons beneath the litter in the bottom of the breeding-cage. These larvæ are very subject to the attacks of parasites; from a small number which I collected I obtained three moths and two Hymenopterous parasites which Mr. E. T. Cresson determined to be the *Phanerotoma tibialis* of Haldeman. One of these parasites issued June 21 and the other June 26."

NATURAL ENEMIES.

Two Tachinid flies were reared from the second brood of larvæ, emerging August 1st. These have been determined by Mr. Harrison E. Smith of the Bureau of Entomology as *Exorista pyste* Walk.

REMEDIES.

The larvæ feed mostly on the leaves which are drawn into the nest and this pest can therefore be easily controlled by an arsenical spray applied to the foliage. On the trees sprayed with lead arsenate (six pounds in fifty gallons of water) for the adults of the walnut weevil no bud-worm injury was noticed. Most all of Dr. Morris' trees, especially the Persian or English walnut, were infested with both the weevil and the bud-moth, so that both insects could be controlled with the same applications. The larvæ of the three broods appeared this season about June 1st, July 10th and August 18th. The weevil is most abundant after June 1st, so if applications are made on the first two dates the bud-moth would be controlled and a large percentage of the weevils destroyed. However, if the weevils are abundant, a second application should be made two weeks after the first. Further trials are necessary to establish practical control methods for this insect, but it is probable that less poison, perhaps three pounds in fifty gallons of water, may prove effective against the bud-moth as well as against the walnut weevil.

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THE MOSQUITO PLAGUE OF THE CONNECTICUT COAST REGION AND HOW TO CONTROL IT.*

The salt marshes along the coast furnish the principal part of the mosquito plague of the southern portion of the State. Contrary to the habits of most mosquitoes, those of the salt marsh species fly inland long distances, and as they are large and very abundant, and are voracious feeders, they make life a burden to many inhabitants, and keep away many others who would otherwise summer on the Connecticut coast. This condition results in preventing the proper development of a legitimate business and the people of the State are so much the poorer on account of it. That the remedy is not impossible, nor impracticable, nor so expensive as most people suppose, and that for agricultural purposes the land is greatly improved by the treatment, the details given on the following pages will show:—

MOSQUITOES OF THE SALT MARSH.

There are two species of mosquitoes which breed abundantly on the salt marshes and which are commonly called salt marsh mosquitoes—the brown salt marsh mosquito *Culex cantator* Coq. and the banded salt marsh mosquito *Culex sollicitans* Walk.

THE BROWN SALT MARSH MOSQUITO.

The brown salt marsh mosquito *Culex cantator* Coq. is large and uniformly reddish brown in color without conspicuous markings, though there are narrow white bands on the legs and on the abdomen. It is shown in figure 1. Breeding upon the salt marsh early in the season, the females bite fiercely and migrate long distances in search of food, going chiefly inland, which in Connecticut is the direction of the prevailing winds. About July 1st, it is almost or wholly replaced by the banded salt marsh mosquito, which is present during the remainder of the season.

THE BANDED SALT MARSH MOSQUITO.

On account of its white markings this is the most conspicuous mosquito of medium size found in Connecticut. All of the legs are banded, dark and white alternating, and the front margin of each abdominal segment is also white and there is a dorsal longitudinal white line on the abdomen. In addition to these striking characters there is a white band upon the beak, about half way between base and tip, and these markings together serve to distinguish this from all other species of mosquitoes.

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* Published as Bulletin 173, July, 1912.

The eggs are laid on the mud of the salt marsh pools and hatch when the pools fill with water. About a week is required in warm weather from the hatching of the egg to the emergence of the adult mosquitoes, which come in swarms or broods and are often extremely abundant, and the females bite ravenously. They migrate inland in search of food, sometimes going twenty-five or thirty miles. It seems to be necessary for the females to obtain blood from one of the higher animals in order to develop their eggs. Most of them are probably able to obtain food within from five to ten miles of their breeding places.

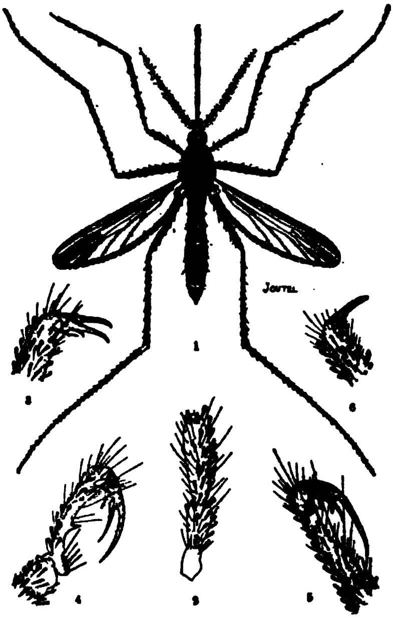

FIG. 1.—The brown salt marsh mosquito, *Culex cantator* Coq.: 1. adult female: 2. palpus; 3. anterior claw of same; 4. 5. 6. anterior, median and posterior claws of male. All enlarged. (After Smith, Report on New Jersey Mosquitoes.)

The banded salt marsh mosquito is far more abundant than the brown salt marsh species, and appearing later in the summer, constitutes the mosquito plague of the shore region, remaining until cool weather prevents further mosquito breeding. This mosquito is the one commonly called the salt marsh mosquito and is shown in figure 2.

Of course there are several species of fresh water mosquitoes of the genus *Culex,* and malarial mosquitoes, *Anopheles,* breeding in the fresh water pools in the rear of nearly every salt water marsh, and rain barrel mosquitoes breed in the cisterns and other receptacles around the shore cottages, but these are local and do not fly far. They do not as a rule breed in salt or brackish water, and do not constitute any important part of the mosquito plague of the Connecticut coast region.

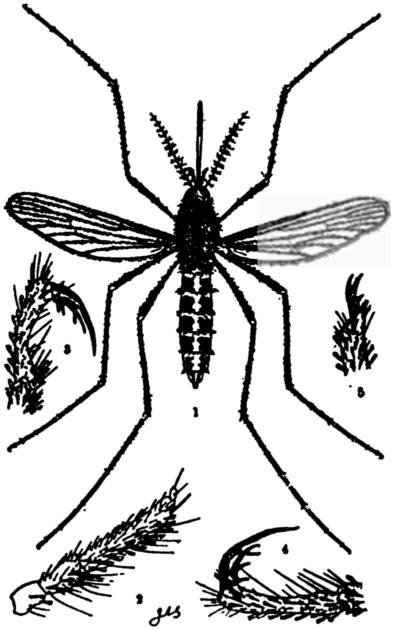

FIG. 2.—The banded salt marsh mosquito, *Culex sollicitans* Walk.: 1. adult female; 2. palpus: 3. anterior, 4. median and 5. posterior claws of male. All enlarged. (After Smith, Report on New Jersey Mosquitoes.)

AREA OF SALT MARSH IN CONNECTICUT.

The salt or tide water marshes of Connecticut contain 22,264 acres or 34.79 square miles,* distributed rather unevenly, along the coast in the southern part of the State. The marsh areas are the most extensive in the middle part of the coastal region, or that portion bounded on the west by the Saugatuck and on the east by the Connecticut rivers. A considerable portion of the coast is hard land, being gravelly or rocky and there are few large tidal marshes, the largest in the whole state being the Quinnipiac marsh, near New Haven, of over 3,600 acres in extent.

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* D. M. Nesbit, Miscellaneous Special Report No. 7. The Marshes of the United States, U. S. Department of Agriculture, 1884.

CONDITION OF THE SALT MARSH AREAS.

In the report of the Mosquito Survey of Connecticut, made in 1904, and published in the report of this station for that year, page 285, it was stated that fully 50 per cent. of the entire salt marsh area of the State had at some time been thoroughly drained for salt hay farming. Other portions are well drained naturally, and so are not serious breeders of mosquitoes.

In recent years, however, salt hay farming seems to have been neglected, though it is hard to understand why; as the hay still brings a price ranging from $7.00 to $12.00 per ton, and there is quite a demand for it for packing, bedding and mulching material. Many salt marshes have been neglected, the old ditches have become clogged, filled or grown up and few new ones have been cut. Such marshes are prolific breeding places of salt marsh mosquitoes. From personal observations, and from conversation with some of the older residents, we may safely conclude that in many cases at least the marshes are in worse condition to-day than they were thirty or forty years ago and mosquitoes correspondingly more numerous. Wherever the marsh becomes sufficiently congested, water stands, the turf rots and a depression is formed which increases in size and breeds millions of mosquitoes.

Nearly every salt marsh receives more or less fresh water from springs or streams emerging from the highland. This water must pass through the marsh to reach the ocean. Some marshes are so congested that the fresh water cannot drain off but is kept back, making soft bogs with considerable stagnant water. Often the highest and dryest part of the salt marsh is near the outlet, while the lowest portion is at the back side next to the highland. In such places, and often nowhere else upon the marsh, stagnant water occurs.

Many persons think that if tide gates are provided, it will prevent mosquito breeding, and that no other work is necessary. But the gates keep out only tide water. Fresh water enters just the same and must be allowed to pass out. Hence drains are necessary. Tide gates only prevent the flooding of the marsh at high tide and are almost negligible so far as mosquito breeding is concerned. It is necessary to do almost as much ditching with as without a tide gate. Wherever the tide rises and falls in the ditches, mosquitoes will not breed.

Tide gates are of much value in salt hay farming, for they keep the marshes from becoming flooded at each perigee tide, and prevent the salt grass from becoming encrusted with salt. Hay is considerably more valuable and a much greater yield is obtained if the salt water is not allowed to flood the marshes during the growing period.

Some communities, however, have recently made a start toward improving the conditions of the marshes. Nearly seven miles of coast marsh land was drained in 1911, just east of Stamford, and the present season similar work is being done about Greenwich, Fairfield, New Haven, Branford and Saybrook. This draining has all been for the purpose of doing away with mosquitoes, and not for increasing the yield of grass, yet the latter result is gained.

MOSQUITO CONTROL.

The general methods of mosquito control are (1) draining of the marshes, (2) oiling the breeding pools and (3) screening of rain water receptacles. The first, viz. draining, is the method to be chiefly considered in connection with the present control of the mosquito nuisance; the second may be employed temporarily until the draining can be carried out, and the third should receive attention each year.

METHODS OF DRAINING.

Where there is a natural stream flowing through the center of the marsh, the area may be satisfactorily drained by cutting simple lateral ditches running nearly at right angles to the axis of the stream, with the outlets bearing slightly toward its mouth.

These lateral ditches should be narrow—not more than ten inches wide—and from 24 to 30 inches deep, according to the character and size of the area to be drained. If there is no stream for an outlet, then a broad central ditch must be cut. This should be fully as deep as the laterals and wide enough to carry off the water supplied by them. The lateral ditches should be parallel with each other and from one hundred to one hundred and fifty feet apart, according to the condition of the marsh. It is not necessary to connect each pool with the tide water in ditching, as the seepage is so great through the porous peat of the salt marshes that pools are often drained and become dry at a distance of sixty or more feet from the ditch.

In draining some Connecticut marshes clay or gravel is encountered in the bottom of the ditch. It is not necessary to cut into this material unless it is near the central ditch where it will trap the water.

Ditches cut years ago for salt hay farming were shallow and open. Such ditches are not recommended and are not being cut at the present time in mosquito extermination drainage work. Shallow and open ditches are easily clogged by floating *debris* and vegetation grows in them readily, choking them and rendering them ineffective. Deep narrow ditches, on the other hand, remain in working condition for a number of years and are seldom clogged by vegetation. All marsh areas should be given attention, however, because in high tides, sods from the ditches, hay, driftwood or other *debris* may float into the ditches and clog them. By a frequent and systematic patrol of the area such conditions may be detected and remedied at once.

Such ditches as are mentioned above can best be cut with hand tools made for the purpose, shown on Plate XI, but on the larger marsh areas of New Jersey power machines may be employed to advantage.

There are always small depressions which should be filled and can be filled easier and cheaper than they could be drained. This is particularly true in the hard land. There are also certain depressions where on account of the expense draining is impracticable. These may be treated by dredging out the center and filling the banks with the material excavated, thus concentrating the water in a permanent pool which should be stocked with fish.

COST OF DRAINING MARSH LAND.

The cost of draining salt marsh land is not prohibitive. In fact it is actually less than most persons expect. From contracts which have been made recently for such work, and from conversing with the contractors, we may state that the salt marshes of Connecticut may be drained, so that they will not breed mosquitoes, at a cost of between $5.00 and $10.00 per acre, or say an average of not over $8.00 per acre. As this area contains 22,264 acres the cost of draining the salt marshes of the whole State would not exceed $178,112.00, a sum insignificant considering the benefit to be derived from its judicious expenditure.

Some contracting firms are prepared to drain marsh areas at a given price per running foot of ditch, the price varying from two cents upward, according to the amount and character of the work to be done.

On some of the large marsh areas of New Jersey, ditches have been cut by power machines at a price as low as one cent per running foot of ditch, and contracts have been made for draining certain definite areas at less than $2.00 per acre.

RESULTS OF DRAINING SALT MARSH.

Wherever salt marsh is properly drained the land rises perceptibly, becomes much harder than before and there is no stagnant water upon it; mosquitoes cannot breed thereon, and consequently all land in the vicinity of the marsh becomes more desirable for residence purposes. If depressions occur and fill with water at flood tide, it will soon seep away before mosquitoes can develop in it. As the land becomes firmer it is easier to get over it, especially with a team, for cutting and removing the salt hay. The character of the vegetation soon changes and the spike grass *Distichlis maritima,* which is characteristic of breeding areas and which always produces a small yield of poor quality hay, gives way to black grass *Juncus gerardi,* which makes the best salt hay and which all over the marsh gives a much greater yield after draining. During the summer a practiced eye can tell at a glance, by the color of the marsh, which portions of it are well drained, showing the bright green of the black grass, contrasting with duller green or gray of the spike grass and the other marsh vegetation of the ill-drained areas.

The yield is often increased three or four fold by simple draining, and land has been known to produce twenty times as much after the operation.*

Such an increase in yield might, even with the crop of a single season, more than pay the cost of draining. But this increase keeps up as long as the drains work and the total increase in yield and quality of the crop is enormous.

This yield, of course, greatly increases the income from the land, which accordingly increases in value as an investment. Surrounding property also becomes more valuable on account of the increase in the value of the marsh.

That the growing of vegetable crops on the salt marsh, where properly drained and dyked, is not impossible, nor impracticable, was demonstrated a few years ago by Mr. F. R. Sammis of Stratford, who grew some excellent celery, asparagus and onions on the big Stratford marsh. In future years, unquestionably some of our salt marsh land will be used to grow such crops.

But more particularly on account of getting rid of the mosquito plague is the benefit felt by those living near the marsh. The people are more healthy and more comfortable. Shore resorts, summer hotels and cottages, as well as permanent residences, all benefit by such improvement work. If the mosquitoes can be eliminated from the coast region of Connecticut—and they will be if we drain the marsh land—there is no more attractive place in the country where one can spend the summer. Last but not least, the railroad and transportation companies will reap a harvest in the increased summer traffic to and from the shore resorts.

OILING OF BREEDING POOLS.

Where mosquito larvæ wrigglers are found in any pool, they may be killed in a few minutes by spreading a film of oil over the surface of the water. It is necessary for the larvæ to come to the surface about once each two minutes to breathe, and the oil not only prevents the air from entering their respiratory system, but the oil also enters their breathing tubes, destroying the tissues, and they soon die.

The oil must be applied about once each ten days to keep the pool in a safe non-breeding condition. For this purpose ordinary kerosene, which can be purchased from any grocer, will answer. Some prefer a heavier oil, called light fuel oil. One grade sold by the Standard Oil Co. as "34° Distillate" has been recommended for this work.

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* J. B. Smith, Bulletin 207, New Jersey Agricultural Experiment Station 1907.

Oiling at its best is but a temporary expedient, and should be practiced on the salt marsh only until the marsh can be drained. In mid summer the tall vegetation often obscures many small breeding places, and likewise makes it difficult to distribute the oil on the surface of the water, where needed,—most of it striking the vegetation.

A convenient method of applying oil is by means of small compressed air sprayers with cylinders of galvanized sheet iron. Each cylinder contains a pressure pump and will hold about two and one half gallons of liquid. It may be carried in the hand or held by a strap thrown over the shoulder. Such an outfit, including short piece of hose with nozzle, may be purchased for $4.50. A two-foot extension rod is almost a necessity and costs thirty-five cents extra.

Where large areas are to be treated, barrels of oil should be distributed at various convenient points, in or around the marsh.

The amount of oil to be applied is one fluid ounce to each fifteen square feet of water surface. A less quantity will often fail to kill the wrigglers.

SCREENING OF RAIN WATER RECEPTACLES.

Many shore cottages are not connected with the water supply of the villages or cities, but rain water is collected from their roofs and conducted into barrels or cisterns, from which it may be drawn as needed. Where these barrels or cisterns are above ground and uncovered, *Culex pipiens* will certainly breed in them. Such receptacles should always be screened, and if it is necessary to take water from the top of the barrel, mosquito netting tacked upon a hoop, somewhat larger than the top of the barrel, can be placed over it and removed at pleasure, and mosquitoes cannot reach the water to lay their eggs.

Tin cans, kettles, broken bottles, clogged gutters and other receptacles on the dump or scattered promiscuously, are prolific breeding places wherever they contain water for a week or more and should never be tolerated.

COMMUNITY EFFORT IN MOSQUITO CONTROL.

In any work directed toward the control of mosquitoes in the salt marsh region, little will be accomplished except through coöperation. If one marsh is drained, some relief will be felt by those residing near it and especially on the inland side of it. But in order to really do away with the mosquito nuisance, all salt marsh areas for a distance of several miles should be drained. In the absence of State legislation, this can be done only through community effort, as the separate property owners will not as a rule coöperate effectively to such an extent, and many of them will not expend a dollar for such improvement work on their own land. If money is raised by subscription and enough procured, then large areas, beginning with the worst ones, can be treated and relief obtained.

Lower prices for draining work will be obtained through coöperation than could possibly result if each owner arranged by himself for having it done.

LEGISLATION NEEDED.

Though much can be accomplished through the coöperation of adjacent communities in treating salt marshes for the purpose of controlling mosquitoes, in order to gain the greatest benefits to all concerned, some state-wide movement should be inaugurated. Authority to drain marshes whether the owner desires it or not, should be conferred upon some officer or commission, especially where it benefits the whole community, the town and the state, without injuring the property or working any hardship to its owner.

Just what arrangement would be best has not been determined, but if the State could bear a part of the expense—perhaps one-half, and give the work proper supervision and insist on its maintenance—and the remaining portion be met by the town and the owner, each paying a certain definite percentage, in just proportion to the benefits received, it would seem to be the most desirable solution of the problem.

The salt marshes are owned by a large number of freeholders, some of whom are non-residents. Most of the owners, if they can be found, are willing to have their lands drained, but occasionally an owner objects, and he is thus able to block a work which, if carried through, would be a great benefit to the whole community or town, including himself.

Legislation is therefore essential to provide for the systematic and wholesale draining of the salt marsh areas of the State.

SUMMARY.

The mosquito plague of Southern Connecticut is composed chiefly of two species of salt marsh mosquitoes—the brown salt marsh mosquito, *Culex cantator* Coq., and the banded salt marsh mosquito, *Culex sollicitans* Walk., which breed in the brackish stagnant pools of the salt marshes and fly inland several miles in search of their food, viz. the blood of the higher animals.

The rain barrel mosquito *Culex pipiens* Linn. breeds in rain water barrels, tin cans and other receptacles along the shore, and certain other species of *Culex,* as well as the malarial mosquito, *Anopheles,* may breed in the fresh water pools next to the highland, yet these are all local, fly only short distances and form only a small part of the mosquito plague of the coast region.

The salt marsh region of Connecticut contains 34.79 square miles, or 22,264 acres, more than half of which has in past years been drained for salt hay farming. During recent years the marshes have received little attention, the ditches have become filled and probably breed more mosquitoes than they did thirty or forty years ago.

The conditions are such as to check the proper and natural development of the Connecticut coast region as a site for summer homes; the land produces little, and is unprofitable, yet taxes are collected upon it.

Tide gates in proper working condition will keep tide water from flowing over the marsh but do not prevent the fresh water entering the marsh from the highland. This must escape to the ocean and draining is the only treatment to be advised. Narrow deep ditches are much more permanent than broad shallow ones. The lateral ditches should be not more than ten inches wide and from 24 to 30 inches deep, and placed from 100 to 150 feet apart, running parallel with each other, and nearly at right angles to the main stream or the broad central ditch.

The cost of draining the Connecticut marshes will vary, but may be done by contract at from $5.00 to $10.00 per acre, and should not average more than $8.00. The entire salt marsh area of Connecticut can be drained for less than $200,000.00.

The increase in yield of salt marsh hay will soon pay the cost of draining and may do so in a single season.

Mosquito wrigglers may be killed by oiling the breeding pools, but this should be considered as only a temporary measure and should not be advocated in place of draining.

The methods of draining and oiling are shown on the plates, and described in detail on the pages of this report. Coöperation of individuals and communities are necessary for successful results in this work, and many towns and communities have taken it up. Legislation, however, is needed, and a State-wide movement with some State supervision would seem to be the best solution of the problem.

MOSQUITO CONTROL WORK IN CONNECTICUT IN 1912.

During the year there has been much interest shown in the subject of mosquito control, and a number of requests were made to this office for the examination of suspected breeding areas and for expert advice regarding treatment. Much has also been accomplished in draining marsh areas, and this paper describes briefly each area examined and also contains a summary of all draining operations to control the mosquito nuisance. For convenience each section or locality is discussed separately.

GREENWICH.

In response to a request for an expert, Mr. Walden visited Greenwich on June 10th, and in company with Dr. E. O. Parker, chairman of Mosquito Committee, Board of Trade, and Mr. Edwin M. Skinner, president of the United States Drainage and Irrigation Company, examined the section within a radius of about one mile of the town hall.

Mr. Walden reports:

"1. At the foot of Nigger Hole Hill is a stream with a series of swampy areas along its course. There is considerable standing water in these places in which mosquito larvæ or wrigglers were breeding. The stream should be cleaned out and deepened so that it will drain all standing water.

2. Near Edgewood Inn is a small swamp with bogs and grass more or less covered with water. Mosquito larvæ were present in the water and many adult mosquitoes were found around the edges. In one direction the land is much lower than the swamp and a single ditch leading to this will give thorough drainage.

3. There is a low area at the right hand side of Prospect street with standing water all through the grass and weeds. This could be drained across the street to a brook on the left hand side which is much lower than the street.

The three above mentioned sections are ideal breeding places for the malarial mosquito (*Anopheles*), which will certainly be found there later in the season. The section near Prospect street is especially dangerous because there are many people living in the immediate vicinity.

Any one of the three places can breed enough malarial mosquitoes to infest the entire borough. Owing to the prevalence of malaria in Greenwich now the conditions will be much worse later in the season when the *Anopheles* become more abundant, if nothing is done to do away with their breeding places."

The Mosquito Committee conducted a campaign, issued literature, and obtained estimates for draining and filling sufficient to abolish the breeding places. The Board of Trade asked the borough officials for an appropriation for the work, but this was not granted, so no draining was done. Dr. Parker later reported a record of nine hundred authentic cases of malaria in Greenwich for 1912.

STAMFORD.

The drainage work here was done in 1911, and covered the entire coast line from the easterly shore of Bell Island to Shippan Point, a distance of about seven miles. Mr. W. L. Searles of Rowayton was chairman of the committee and was the leader in educating the people and arousing them to definite action. About $2,800.00, raised by voluntary contribution, was expended for draining 200 acres, and 125,000 lineal feet of ditches were cut. The residents are well satisfied with the work. This office had no part in this work, though in previous years the region has been examined twice and advice given.

DARIEN.

As in Stamford, the money was raised by voluntary contribution, and $3,800.00 was expended in draining an area amounting to approximately 300 acres of salt marsh and some inland swamps. The work was completed late in 1912.

SOUTH NORWALK.

In the work of South Norwalk and Darien, as well as in that of Stamford, Mr. Searles was the leading spirit. About 600 acres were here drained at a cost of $7,500.00, also raised by voluntary contribution, and the work was done in the summer of 1912. This office can share no credit for the campaign here or at Darien.

FAIRFIELD.

The campaign in Fairfield was started by local initiative in November, 1911, and a committee arranged meetings and obtained contributions for the abatement of the mosquito nuisance. Six public-spirited citizens gave $1,000.00 each, and it was not a difficult matter to raise by voluntary contribution enough to make $8,400.00, which was the cost of draining 1,250 acres of salt marsh and some small inland areas. Before contracts were let, the Improvement Association of Fairfield and vicinity became incorporated and took charge of the work. Mr. Oliver G. Jennings was president and Dr. Valery Havard, secretary. No dues were required and a large membership was sought and about 300 joined the organization.

No oiling or other temporary measures were practiced at Fairfield, draining being the only means considered. The ditching was started in June and finished about August 1st.

The results are evidently satisfactory as Dr. Havard stated that the people were now able to use their porches with comfort afternoon and evening.

NEW HAVEN AND VICINITY.

The Anti-Mosquito Committee, a sub-committee of the Committee on Sanitation of the Civic Federation of New Haven, instigated and, in coöperation with this office, planned a mosquito campaign. All other civic and health organizations were asked to coöperate and several meetings and conferences were held.

The officers of this committee were Dr. Louis M. Gompertz, chairman; Seymour C. Loomis, secretary; and Thomas W. Farnam, treasurer.

By means of illustrated and other lectures, newspaper articles and circulars the matter was agitated in early spring and the week beginning April 22d was set apart as "donation week" or "mosquito week" for raising funds. Through an effort organized and directed chiefly by the secretary named above a house-to-house canvass was made. Altogether nearly $5,000.00 was obtained by voluntary contributions in New Haven and vicinity, including adjacent portions of Orange and East Haven.

Fourteen lectures, treating of mosquitoes, were made by Messrs. Britton and Walden in or near New Haven. Five of these were illustrated with lantern slides, and most of the others were illustrated by specimens, photographs or charts. It is believed that much good resulted from the campaign aside from the money raised and the drainage and oiling work accomplished. An ordinance to prevent the breeding of house flies was passed by the board of aldermen, and a mosquito regulation adopted by the board of health. An appreciable advance was made in educating the people to recognize that these pests can be controlled.

Experts from this office examined the whole area several times in the season, both to locate breeding areas and to inspect the work of oiling and draining.

Before expending this money the Anti-Mosquito Committee was incorporated without capital stock, in order to put the work on a better business basis. Mr. P. L. Buttrick was employed as field agent, to have immediate charge of the oiling and other field work.

DRAINING.

The principal breeding places were drained, beginning at Morris Cove and extending eastward to Silver Sands, and including several separate small areas in the West River meadows. The area drained is estimated at 347 acres, and cost $3,567.00. Bids were first obtained on draining a certain area at Morris Cove, situated partly in New Haven and partly in East Haven and extending up both sides of Morris Creek, from its mouth northward as far as the salt marsh reaches. Three drainage contractors visited the area and submitted bids. The contract was awarded to the lowest bidder, The United States Drainage and Irrigation Co., 17 Battery Place, New York City. There must be a new tide-gate built on Morris Creek below South End road before the full benefit of the ditching will be realized. The property owners expected to build one, but have not done so. Included with the Morris Cove area, in the first contract was a small plot of twelve or fifteen acres in Fort Hale Park. This area was in bad condition and needed draining. The land is owned by the United States Government but is turned over to the City for use for park purposes. The work on this contract was completed early in July. The ditches were inspected by Mr. Walden on July 22d, and again on July 29th in company with Mr. E. M. Harvey of The United States Drainage and Irrigation Co.

Later this firm was employed to drain the South End marsh on a basis of a footage rate per lineal foot of ditch. On account of lack of funds, this marsh, especially at its eastern end, was not entirely drained, though most of the mosquito breeding was stopped in it. Nevertheless about 10,000 feet more of ditches are needed there to perfect the work, and should be cut as soon as funds are available.

Though the worst breeding places were drained first, it was thought best not to expend all of the money for permanent work in the same section. The West River meadows contained several small areas that needed treatment, and contracts were awarded to the same firm to drain two such areas; one west of the river between the New York, New Haven and Hartford Railroad tracks and Washington Avenue, and the other on the east side between Congress Avenue and the Derby Railroad. This work was done in August and was all examined August 21st, by the State Entomologist, in company with Mr. P. L. Buttrick, field agent of the Anti-Mosquito Committee and Mr. Edwin M. Skinner, president of the United States Drainage and Irrigation Co. Mr. Skinner recognized a few defects and promised to, and later did, send his men to remedy them. This drainage work, while on the whole satisfactory, must be extended over nearly all of the salt and some of the fresh marshes around New Haven, before the mosquito nuisance can be entirely eliminated. Draining, filling or dredging, i. e., permanent work should be executed wherever possible, and other measures should be regarded as of doubtful expediency.

OILING.

The committee early planned to keep oiled through the season such breeding areas near the city as could not be drained. Though a simple matter in fresh water pools and receptacles it is a difficult one on large salt marshes. These areas are flooded at the perigee or very high tides, which though not as high in 1912 as in some seasons, came oftener and the meadows were flooded longer than usual, making it all along the Connecticut coast one of the worst mosquito seasons within the memory of the residents.

On much of the salt marsh area the grass is not cut for hay but water stands in it deep enough and long enough to produce mosquitoes. The presence of the grass interferes seriously with applying the oil to the surface of the water. Where the water occurs only in pools the matter is comparatively simple, but in late summer and early fall the very worst breeding places were in the grass, and many of these areas showed no signs of breeding in the spring and early summer.

At first the oiling was done with small knapsack compressed air sprayers. The "Auto-spray" shown on plate XIII made by the E. C. Brown Co., Rochester, N. Y., was first employed, being available, light and inexpensive. But this pump did not prove to be very durable and later one of the "Simplicity" pumps, made by the McCormick Manufacturing Co., of Dayton, O., was ordered.

No work was done on the Quinnipiac marsh, but all other marshes near the city not drained were oiled. As the grass breeding became more extensive and intensive toward the latter part of the summer more powerful pumps were needed, and a Hardie Wheel Outfit was procured. After a trial, the "Double-Forester," designed for fighting fires and made by W. & B. Douglas, Middletown, was purchased. Both of these pumps were quite effective, though requiring two men to each outfit. Each pump is sufficiently powerful to throw a heavy spray or solid stream for some distance, and it is unnecessary to walk over the entire area as is the case with the smaller outfit. But even larger outfits were given a trial. When the breeding season was at its height Mr. Buttrick borrowed some barrel spray pumps, such as are used for spraying trees, and hired extra men to use them. By such means he was able to head off one brood of mosquitoes which was in danger of emerging before the territory could be covered by his regular force with the small pumps.

Altogether nearly $1,000.00 was expended in oiling. It is rather expensive, costing on the salt marsh about one-fourth to one-third as much in one season as to drain the same area. The drains, with slight attention, are effective for many years, but the oiling must be repeated with the subsidence of every high tide.

For part of the work kerosene was used, chiefly because it could be procured at a reasonable price at every corner grocery, often saving expense in the time of the men, if it had to be carried long distances from a central distributing point. But later in the season when more oil was used several barrels were purchased of a heavier oil, known as "light fuel oil" or "34° distillate," and a barrel placed near the center of each particular area where it would be used. This oil is somewhat less expensive than kerosene, and lasts longer upon the surface of the water. It is probably more destructive to vegetation, and to animal life in the water than kerosene—though both kill mosquito larvæ readily. The Park Commissioners oiled the breeding places within the public parks.

From the actual cost of doing the work, Mr. Buttrick computed that for the early brood the cost per acre might be as low as three cents. In midsummer the cost was about sixteen cents per acre per brood, while for the heavy broods of August and September the expense probably reached $1.00. The average per brood would probably be nearly fifty cents per acre. If there are seven broods in a season it will be seen that the cost of oiling alone may amount to $3.00 or more per acre, for a single season.

As most of this marsh land can be drained for less than ten dollars per acre, systematic oiling is hardly to be advised.

FUTURE WORK AROUND NEW HAVEN.

In order to be practically rid of the salt marsh mosquito nuisance, more draining must be done next year. This should include the area on the east side of the harbor north of Fort Hale Park, portions of the Mill River meadows, Quinnipiac marsh, West River meadows, and at Sandy Point, Old Field Creek and Cove River marshes in Orange. Additional ditches should be cut at South End, and there are still other marshes in East Haven between Momauguin and the Branford line. The City of New Haven should also drain Beaver Swamp, where malarial mosquitoes breed abundantly, and all other breeding places within its park area.

CORPORATIONS INTERESTED.

Several transportation and manufacturing corporations have shown sufficient interest in the subject to have their marsh land examined and estimates obtained for draining it. For the most part the estimates were submitted late in the season and action was deferred until the following spring.

BRANFORD.

In 1911 some draining work was done north of Short Beach, and several years ago Mr. Wm. A. Bryan, at his own expense, drained many acres of salt marsh near Indian Neck. Dr. Chas. W. Gaylord has also at different times exercised his authority as health officer to drain areas where malarial mosquitoes were breeding. Several years ago the residents of Pine Orchard raised money and drained a small marsh and oiled other areas near that settlement.

Early in 1912, Dr. Wm. H. Carmalt, chairman of the House Committee of the Graduates Club, asked us to make an examination of the marshes in the vicinity of Double Beach, the hotel there having been rented by the Club. Mr. Walden, with the help of Mr. Kirk, examined this area. That portion west of Double Beach was examined on May 10th, and the remaining portion west, as far as Branford River, on May 20th. Had the examination been made in July, August or September, mosquito breeding would have been found far more extensive, as is the case in all salt marshes. Mr. Walden's notes refer to breeding places located on maps by means of numbers and are as follows:

Marshes west of Double Beach, examined May 10, 1912.

"603. At entrance of hotel grounds on both sides of drive, there is standing water in which wrigglers were breeding (fresh water species).

604. Holes blasted in the ledge, which hold water and in which fresh water wrigglers were found.

605. This whole marsh area is in bad shape. The old ditches are choked and the marsh is soggy, with much standing water, in which salt marsh wrigglers (probably *Culex cantator*) were abundant. It will be necessary to reditch this whole section to prevent breeding. The worst breeding is across the north end and down the east side, next to the road covered with crushed stone. Near the entrance to the private place there is breeding on both sides of the road.

606. Small, soggy areas which need draining. Wrigglers were present in all standing water.

607. Small marsh of two or three acres across the south side of which is a roadway with stone retaining wall next to water. Towards the west end was a sluiceway through which flows the stream that drains the marsh. This sluice has collapsed, choking the stream so that the marsh contains standing water, especially on the north and east sides. The water contained large numbers of wrigglers. The sluiceway should be repaired and small ditches should be dug from the edges of the marsh to the main stream.

608. In the whole upper half of this marsh and west of the stream down to the road where the trolley runs, mosquitoes are breeding abundantly."

Marshes east of Double Beach, examined May 20, 1912.

"609. Small marsh north of Double Beach Hotel; a few wrigglers were found. A single ditch from shore to west side of area will drain all standing water.

610. The west and north portions of this marsh have much standing water, and mosquitoes are breeding in it. Should be drained.

611. South edge of this small marsh next to high land has choked ditches with standing water and is breeding mosquitoes.

612. A low marsh flooded by tide when examined. No mosquito breeding found.

613-614. Water standing at these spots, containing wrigglers.

615-616. Standing water which may breed mosquitoes later in the season.

617. Sparse breeding along the edge of marsh.

618. Upper end of marsh, where the drainage has been cut off by a road crossing to a sand bank on west side.

619. This marsh is in very bad condition. The whole area is in need of ditching. The worst breeding spots in the sections are marked 619."

Estimates were procured on draining these marsh areas, but nothing else has been done. Possibly next season may bring some definite action.

In May, 1912, Mr. David Daggett of New Haven applied to this office for an expert examination of the region about Pine Orchard, to learn what measures should be adopted to eliminate the mosquito nuisance there. As we were all busy, at our suggestion, Mr. P. L. Buttrick was employed for this purpose by Mr. Daggett, who requested that the report be submitted to this office for approval before further action on it was taken.

The examination was made during the latter part of May and a report of six typewritten pages and a map was submitted for my approval May 29th. This report covers the coast from Branford River to Stony Creek and includes data on fresh as well as salt marshes. The suggestions for treatment have not been adopted as far as I can learn, so there still remains considerable work to be done in this section.

GUILFORD.

A citizen of Guilford is authority for the statement that the selectmen have caused to be drained certain sections of marsh land in that town. I do not know the area treated nor in what year the work was done.

OLD SAYBROOK AND OLD LYME.

My first knowledge of any attempt at mosquito control near the mouth of the Connecticut River resulted from the call at my office of Mr. Brooks on May 17. He stated that at Fenwick, where mosquitoes had been quite a nuisance, the residents had determined to use an abundance of oil, floating it in on the tide as a relief measure. I advised him that draining was the proper means, and cautioned him against expending too much money upon oil.

Nothing more was heard from this section until October, when I received a letter from Mr. R. A. Rutherfurd of Black Hall, who had planned to procure estimates on draining the entire area, a portion of which lies in the town of Old Saybrook and the remainder in Old Lyme. Mr. Rutherfurd obtained estimates, saw the residents most interested and enlisted their support, then arranged for two meetings on November 1st, one at 4 P. M. in Old Saybrook and another at Old Lyme at 8 P. M. A representative of the United States Drainage and Irrigation Co., which made the estimate, was present, and the State Entomologist gave a brief talk at each meeting. Since that date a committee in Old Lyme has organized an Anti-Mosquito League and in all probability some draining will be accomplished next season.

Fresh Water Breeding Places.

On May 16th, at the request of Dr. Wm. H. Carmalt, I visited the property formerly known as Lion Park, now owned by the New Haven County Anti-Tuberculosis Society, on Campbell Avenue, West Haven, making an inspection of possible mosquito breeding places on the property. The following report was submitted to Dr. Carmalt:

"That portion fronting on Campbell Avenue, where several drains have recently been installed, is now in good condition. There is a little moisture above ground, due to the recent heavy rains, but I believe this will entirely disappear after a few days of pleasant weather. The only portion of the ground which needs any treatment is the brush-covered area near the southwest corner. There is more or less water standing in the depressions scattered over a part of this area, and the deeper pools, or nearly all of them, contain mosquito larvæ, some of which are nearly full grown. These are probably *Culex canadensis,* one of the species which breed in woodland pools early in the season. The brush here grows so thickly that it is difficult to get through it to make a careful examination of this part of the grounds. Kerosene should be put on these pools at once, in order to kill the larvæ now in them. The oil can be applied easily on these small pools with an ordinary sprinkling can, though it is necessary first to cut some of the brush in order to get at them.

I believe that the best treatment for this area is to cut a ditch perhaps eighteen or twenty inches deep and a foot wide, running through the center of the swampy area in a westerly direction or perhaps a little north of west, following the natural drainage line to the swamp near the railroad back of your property. Perhaps it will be necessary to cut a few short lateral ditches leading into the larger breeding pools, using the material removed from the ditches to fill in the small depressions. This work, of course, can be done under the direction of any engineer or contractor, and presents no particular difficulties.

I presume there is more territory west of your property which also needs draining, though I did not look over the adjoining field."

On June 20th, 1912, at the request of Dr. W. S. Lay, health officer of Hamden, I accompanied him in his automobile, from the corner of Whitney and Putnam Avenues, to look at some stagnant pools which he regarded as unsanitary.

First we went through Putnam Avenue, to where a small sluggish stream crosses upper Newhall Street. This stream comes from the vicinity of Prospect Street, near the base of Mill Rock, and crossing Newhall Street, enters the swamp owned by the New Haven Water Company. A high wire fence prevented us from examining the water on this property, but where it crossed the street, as well as above it, was in a filthy condition. Though the water was tested at a few places for wrigglers, none were found. Dr. Lay pointed out a number of houses nearby where undoubted cases of malaria occurred last year and this spring. This seemed to be the source of the malarial mosquito. From the condition of the stream and swamp it must surely breed malarial and other mosquitoes later in the season, and should be regarded as dangerous, at least in its present condition. The Water Company should cut, on its own property, a deep central ditch, sufficiently broad to carry off the water, with a few laterals to drain the margins of the swamp. The material excavated should be used for filling depressions between the ditches. Above Newhall Street, the bed of the stream should be cleared and straightened, some of the brush cut and the water stocked with minnows. Several coves in the margin of the upper part of Lake Whitney receive surface water from the surrounding territory and are separated from the main part of the lake by sand bars which are supposed to act as filters. These cut off parts of the lake, must certainly be mosquito breeding areas at times and should be given attention. The margins are shallow and more or less grown up with vegetation. Even if stocked with fish there would probably be mosquito breeding around the edges.

We then went north and west, where, between Dixwell and Circular avenues, and south of Cherry Hill we found a large stagnant pool, of perhaps eight or ten acres in extent. Apparently this pool has no outlet, but the water is shallow and grass grows through it over most of the surface. We did not test this pool for mosquito breeding. At Mt. Carmel post office we turned to the east and then to the north, into the road running parallel with the trolley tracks. At a point directly back of Mr. Woodruff's, opposite the vicinity of the Station farm, there are at least three sink holes, each containing a foot or more of water, all more or less grown up with brush, the present species being button bush, and half of the bushes were dead. Various aquatic plants grow around the margins, the latter so covered with brown scum that it was difficult to examine the water. Adult mosquitoes, resembling *Culex pipiens,* fairly swarmed here. We did not succeed in finding larvæ, and on account of the soft mud around the edges and the lack of rubber boots, it was impossible to make tests except in a few places. These places were formerly drained into the stream which is only a short distance eastward, but the ditches need to be deepened and the brush should be cut to let in the sunlight and to facilitate the work of draining and oiling. These places are on land either owned or controlled by the New Haven Water Company, and should receive attention at once, as the residents of the vicinity have already entered a complaint.

Returning to the trolley line at Mt. Carmel center, the commencement of the old canal and at the south end, near the railroad station we found one malarial wriggler in the water.

Advised Dr. Lay to work for the permanent draining of this canal, and to fill portions of it, if not possible to drain it entirely.

ORGANIZED EFFORT TOWARD LEGISLATION.

Knowing the interest in the subject of mosquito suppression, and its importance to the people of the State, the Station called a meeting for September 17th, and invited all men to attend who were known to be interested in the object of the meeting. Nearly one hundred invitations were issued, but less than twenty were present. Many letters were received from others expressing their regret that on account of previous engagements they were unable to be present. Dr. Gaylord of Branford was chosen chairman. The situation in all its phases was discussed, and the speakers were unanimous in declaring legislation necessary. Consequently it was moved that the chairman appoint a committee of five to further consider the matter and, if it saw fit, to draft bills to be introduced into the next legislature, the committee to report at another meeting to be called prior to January 1st, 1913.

The committee, of which Dr. Chas. J. Bartlett of New Haven was chairman, met twice and decided upon two measures, one providing for the drainage of the larger marsh areas, and the other giving more authority to the health officers to remedy local mosquito troubles. These bills were submitted to the people attending the second meeting at the Station, November 22. Through a suggestion made at this meeting, a portion of the second bill was omitted and the matter covered by an amendment to Section 2526 of the General Statutes (Revision of 1902). The meeting then voted approval of these three measures and the chairman was empowered to appoint a committee to acquaint the people with these proposed laws and to support the bills at the legislative hearings. Dr. Wm. H. Carmalt of New Haven was appointed chairman of this committee.

The following table shows the approximate number of acres of marsh land which have been drained recently, and all but the Stamford work was done in 1912. Moreover, the cost, which is also shown in the table, was borne by voluntary contributions:

MOSQUITO DRAINAGE WORK IN CONNECTICUT.

Location.	Approximate Acreage.	Cost.
Stamford	200	$2,800.00
Darien	300	3,800.00
South Norwalk	600	7,500.00
Fairfield	1,250	8,400.00
New Haven	347	3,567.00
Total	2,697	$26,067.00

OUTBREAK OF THE FALL ARMY WORM.

Laphygma frugiperda S. & A.

On September 3d a few specimens of the larvæ were received from Mr. Fred Hoadley of Stonington, where they were devouring the grass of a lawn in the village. The caterpillars were collected on August 31st, and Mr. Hoadley reported that they seemed to eat grass only, and had destroyed the lawn. Mr. Hoadley had sprayed the remaining grass with lead arsenate, which killed the larvæ.

On September 10th a large number of larvæ and pupæ were brought to my office from the lawn of Mr. Thomas Hooker, 51 Hillhouse Avenue, New Haven, where they were rapidly devouring the grass. Many of the larvæ had Tachinid eggs fastened upon their heads and bodies, showing that they were strongly parasitized.

The next day, September 11, in response to a request, I visited Branford House, the residence of Mr. Morton F. Plant at Groton, to examine the work of this insect. Several acres of lawn had been entirely devastated and the ground was being disked preparatory to reseeding. Many of the caterpillars here had pupated though some were still small, and apparently about half grown. Here also were many Tachinid eggs indicating that parasites were present.

On September 11th another box of specimens was brought to the Station by Mr. William Roberts, from the field of his neighbor, Mrs. Upson. In this case the larvæ were devouring millet and doing considerable damage. These also showed evidences of parasitism and there were pupæ in the box.

On September 22d adults emerged from the material collected at Groton and also from New Haven material. Adults continued to emerge until October 9th.

Dr. Felt* reports that this insect was very abundant in the vicinity of New York and on Long Island the latter part of September and the first part of October. It attacked lawns chiefly, but injured corn on Long Island.

From a circular issued August 31st, by the Secretary of Agriculture, it appears that this insect has this season caused great destruction of crops in the Gulf States and northward, attacking nearly all kinds of vegetation, but especially grass, corn, alfalfa, cow peas, cotton, sugar cane and rice. The fall army worm was not the only offender in this southern invasion but was accompanied by the true army worm *Heliophila unipuncta,* Haw., and by the cotton worm *Alabama argillacea,* Hübn. In Connecticut, however, these two last named species were not seen in the adult stage, though the army worm is probably present in small numbers and several adults have been taken at light each season.

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* Journal of Economic Entomology, Vol. 5, p. 403, October, 1912.

Description and Life History.

The adult of the fall army worm is a moth belonging to the family Noctuidæ, and has a wing expanse varying from one and one-fourth to one and one-half inches. The primaries are narrow and in the male are often without prominent markings, being uniformly mouse grey. The female has conspicuously mottled primaries, which can be seen better than described if the reader will examine plate XIV, a, of this report, where both sexes are shown. The secondaries in both sexes are nearly white, semi-transparent and iridescent, with a dark border, which is broadest at the apex, and gradually diminishing and disappearing altogether before it reaches the inner angle.

Body mouse grey, somewhat lighter than the primaries. The females lay pearly-white ribbed eggs in clusters of 50 to 60 and covered with mouse-colored hairs from the abdomen of the parent. These eggs are laid on the leaves and stems of grasses and when abundant the females often deposit eggs on the leaves or twigs of trees, walls, fences and buildings. The eggs hatch in about ten days and the young begin to feed upon their favorite food plant, which is usually grass of various kinds, with the cereals as second choice, followed by the other crops mentioned. There are probably two generations in this climate and the larval period is not well known here. It probably varies greatly in different seasons. Our collection contains several adults collected in Maine between August 10th and September 7th. The late appearing female moths lay eggs, but from studies made at Washington, D. C., a few years ago, it appears that though these eggs hatch and the larvæ feed until cold weather, then go into the soil, that they are not able to survive the winter. In most cases the adults do not emerge in the fall, but pass the winter as pupæ and appear the following May. As we have a good supply of material we hope to be able to make further observations on the life history of this insect.

The full grown larva varies from one to one and one-half inches in length and somewhat resembles the common army worm but is darker in color. The Stonington specimens were described as follows:

Length 28 mm. (1⅛ inch): thickness 3 mm. Color dark purplish grey or black dorsally, greenish or light brown ventrally. A spiracular lateral stripe extends longitudinally, with yellowish ground-work faintly marked with light brown. There are narrow, broken, subdorsal lines of cream color, with faint parallel tracings between them. The first segment has a well-defined, cream-colored dorsal line which disappears entirely on the second or third segments. Anal segment with cream-colored dot. Head black, shining, with an inverted Y-shaped, cream-colored, facial mark. Antennæ white with black tips. Legs brown. Each abdominal segment shows dorsally six black tubercles, the front pair being nearer together than the rear ones, the lateral pair being distad of the front and caudad of the rear pair. There are two rows of black tubercles below the yellow spiracular stripe. Each tubercle bears a short black and rather stiff hair.

The pupa is about five-eighths of an inch long, brown and much resembles the corresponding stage of other Noctuid moths. Larvæ, pupæ and adults are shown on plate XIV.

NATURAL ENEMIES.

I have already mentioned that the larvæ were parasitized. Three female Tachinid flies emerged October 5th, from the Groton material. These were identified by Mr. Harrison E. Smith of the Bureau of Entomology, as *Winthemia quadripustulata* Fabr., a species common on this as well as on other hosts. Chittenden* mentions another fly, *Frontina frenchii* Will., of the same family reared from material collected at Columbia, S. C. He also mentions the Hymenopterous parasites, *Apanteles*

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* Bureau of Entomology, Bull. 29, p. 36, 1901.

laphygmae Ashm., MSS., *Limneria dubitata* Cress., and *Euplectrus comstockii* How., as having been bred from the larvæ. Several specimens of wasps are known to attack the larvæ in the Southern States and the larva of a ground beetle, thought to be the fiery ground beetle, *Calosoma calidum* Fabr., is known to prey upon them. This beetle is common in Connecticut.

Control Measures.

Lawns may be sprayed or drenched with an arsenical poison, preferably lead arsenate, to kill the larvæ which feed upon it. This was used by Mr. Hoadley with good results at Stonington, and would be particularly effective in the early stages of the damage before the larvæ are fully grown. It usually happens, however, that the larvæ remain unnoticed until they have made their work conspicuous, and by that time many have transformed to pupæ. It is then too late to poison them. Applications of kerosene emulsion, followed with copious drenchings from the hose, is said to be effective.

There are several mechanical measures that may be employed. One of these is to roll the ground in early morning or in late afternoon when the larvæ are feeding, going over the land several times with a heavy roller.

At Groton a disk harrow was employed to cut up the turf, to make a suitable bed for reseeding the lawn. Possibly this treatment was unnecessary. Even though the grass was wholly devoured above ground it would come up again and be green if the crowns of the plants or the rootstocks were not destroyed. Nevertheless, the harrow was in operation when I visited the place and I advised that it be driven over the lawn many times in different directions to kill as many as possible of the larvæ and pupæ.

As most of the insects winter as pupæ in the soil, late fall plowing may be regarded as an important control measure, especially on land where the field crops have been attacked and injured. It is not advisable for lawns. If large flocks of chickens or turkeys can be placed upon an infested field, no doubt many of the larvæ and pupæ will be devoured.

Attention should be given this insect next year, as the fall army worm sometimes causes considerable damage earlier in the season.

SERIOUS INJURY BY WHITE GRUBS.

In the report of this Station for 1909, page 372, there was published a short account of injury to grass lands that season by white grubs. Judging from observations, correspondence and other reports, this injury in 1912 far exceeded that of 1909, and not only was grass damaged but various cultivated crops such as strawberries, corn and even potatoes were badly injured.

Specimens of the grubs were received July 23d, from Botsford; August 22d, Bethel; August 23d, Noroton Heights; August 28th, Darien and Saugatuck; September 12th, Noroton; September 28th, Meriden; and October 15th, Fairfield. Inquiries were also received and answered from Colchester, Norwalk, Wallingford, Prospect, Cheshire, Watertown, Plantsville, Southport, Southbury, New York City and Hammonton, N. J. At Prospect, Cheshire, Noroton, Darien, Southport, Fairfield, Southbury, Meriden and New York City the grubs caused injury to grass in meadows and in one case on lawns. Injury to corn was the reason for inquiries from Botsford, Colchester, Norwalk, Wallingford and Cheshire. Mr. Filley reported a case in Southington where two acres of corn had been killed by the grubs. The inquiries from Bethel and Watertown reported strawberries as being the crop chiefly damaged, and serious injury to potatoes was the complaint from Noroton Heights, Darien, Saugatuck and Plantsville. Mr. Moss reports very serious injury to potatoes in West Cheshire. In one case a row five rods long furnished at harvest only thirteen good potatoes. On the land of the Northeastern Forestry Company at Cheshire, where several acres were devoted to potatoes, only about 25 per cent. of the crop escaped injury. Here, also, there was great damage to forest tree seedlings. White pine is the kind of tree grown there most extensively and it was the most injured, nearly 25 per cent. of the seedlings being damaged. Some of the seedlings lost their roots entirely, as shown on plate XV, a, while others were partly eaten off. Black locust and other kinds of hard wood seedlings were also attacked and injured, though to a less extent. The inquiry from Hammonton, N. J., stated that the grubs were destroying lettuce plants by eating the roots in the beds, where they were evidently introduced in the compost, which is usually made of turf and stable manure. Professor Forbes found thirty-four grubs in a single hill of corn in an Illinois field.

The dry season seems to favor the increase and abundance of white grubs. Several such droughts in succession generally precede or at least accompany severe white grub injury. Normally, grubs are present in the soil and feed upon grass roots, but it is only when abundant that they cause conspicuous damage. Plate XV shows the adult beetle, larva and the injury caused by this insect.

LIFE HISTORY.

White grubs are the larvæ of May or June beetles, belonging to the genus *Lachnosterna* and to the family Scarabæidæ. There are many species in the United States, and our collection contains fourteen species taken in Connecticut. Probably several others occur here. Of this number *L. fusca* Frœh., *L. crenulata* Först., *L. hirticula* Knoch., *L. nova* Smith, and *L. fraterna* Harris, are the common ones and one or more of these are doubtless responsible for the damage to grass and hoed crops. Most of our material was examined by Mr. John J. Davis of Lafayette, Ind., who is working on this genus for the Bureau of Entomology. Though the exact life history has not been carefully worked out for each species, it is supposed that three years are required for the insect to pass through the entire period of development from the egg to the adult beetle. Most of this time is occupied by the larval period and passed in the soil. It is the last year as grubs when they are large and voracious that the larvæ do most of their feeding and consequently most of the injury. The work of the smaller and younger grubs of a later generation is probably seldom noticed, though usually occurring in the same field with the larger ones.

The eggs are laid in the month of June in grass land or cultivated fields, and are white, oval, and about one-tenth of an inch in length. Each egg is laid in a ball of earth perhaps a half inch in diameter and placed in the ground from one to five inches beneath the surface. In about two weeks the eggs hatch and the young grubs begin to feed upon the roots, growing slowly at first. At the end of the first and perhaps the second seasons the grubs go downward from seven to fourteen inches below the surface to pass the winter. At the end of the last season the grub makes an earthen cell in the ground, and after three weeks there, changes to a soft, light brown beetle. It remains in the ground, however, until the following spring, when in May or June it emerges a dark, brown beetle with hardened wing covers. The adult beetles feed at night on the leaves of various trees, sometimes defoliating them. It is probable that the various species may have different feeding habits and food preferences, but these are not well known and must here be treated as if the same. The beetles hide through the day in the soil and may often be turned up with the rake or the spade in the garden. In early evening late in May and during the first part of June the beetles make much noise in their clumsy flight and certain species are attracted by lights and may be found in large numbers under arc lights.

Control Methods.

Like several other noxious insects, white grubs should be controlled by cultural practices rather than by the use of applications. Corn, strawberries and other crops commonly damaged by white grubs should not be planted on sod land as it is usually on such ground that the greatest damage occurs. Rotation of crops is apt to prevent this multiplication and it is where land is kept in grass for several years at a time that it is most seriously injured. If hogs can be turned upon infested land they will root it over and devour the grubs. Skunks have a similar habit, and I saw years ago in New Hampshire acres of grass so eaten at the roots that the turf could be rolled up like a carpet and the field filled with holes where the skunks had been digging after the grubs.

Fall plowing is to be recommended as it brings the larvæ and pupæ to the surface, where they are killed by freezing. If flocks of turkeys or chickens follow the plow they will eat many of the insects as will also blackbirds and crows.

Often the injury is noticed in midsummer, when it is advisable to plow the land and sow it to Hungarian or millet, thus getting another crop from it the same year. If the injury appears too late in the season for this practice, the land may still be sown to rye. In any case, whether the ground is plowed in late fall or in spring, midsummer or early fall, it should be pulverized very thoroughly by going over it several times in different directions with a disk harrow to kill the larvæ or beetles. It is questionable if any application of chemicals, as is often advised, is worth considering. Common salt, lime, kainit and muriate of potash are sometimes recommended to kill white grubs, but the cultural practices mentioned are preferable; though any good fertilizer has a value other than for killing grubs.

MISCELLANEOUS INSECT NOTES.

A Gall-making Beetle of the Hop Hornbeam.—In April 1911, Mr. A. B. Champlain, then an assistant in this department, while visiting at Lyme, collected some branches of hop hornbeam or ironwood, *Ostrya virginica,* containing swellings or galls. On cutting open the galls, some were empty, while others contained borers, and a spiral gallery was visible. The branches were placed in breeding jars with the ends in moistened sand to prevent too rapid drying. In due time, on May 29th, three adult beetles were obtained. They belong to the family Buprestidae and to the genus *Agrilus.* They were sent for identification to Mr. C. A. Frost, South Framingham, Mass., who pronounced it a new species, and who was requested to describe it. Mr. Frost has named this species *champlaini,* in honor of the discoverer, and the description was published in the *Canadian Entomologist,* Vol. XLIV, page 245, August, 1912. The appearance of the gall is shown on plate XVI, c. Other specimens have since been reared by Mr. Kirk.

The Spruce Bud Moth, *Tortrix fumiferana* Clem.—This insect seemed to be unusually abundant in 1912. Several adults were taken at light on July 17th. On July 22d several adult moths were received from Dr. E. H. Jenkins, collected at his summer home, Pemaquid Point, Me., where he says that the larvæ defoliate and ultimately kill the spruce trees. The adults were mating at the time he collected them and the air was filled with them flying about. In a trip through eastern Massachusetts and along the coast in New Hampshire and into Maine during July, the writer also saw hundreds of these moths. In Connecticut, however, I have never seen them as abundant as they were the past season. Occasional spruce twigs which may have been damaged by this species have been sent to this office. Two were received from New Haven and one from Stamford in 1911, but we were not able to rear the adult. An illustrated account of the destructive work of this insect may be found in the Fifth Report of the United States Entomological Commission, page 830, 1890, and a compiled account is given by Dr. Felt in his "Insects Affecting Park and Woodland Trees," page 416, 1906.

The moth has a wing-spread of an inch or slightly less, and the wings are finely mottled with light and dark brown. The winter is passed in the partly grown caterpillar stage among the terminal shoots of the branches, and in the spring the larvæ feed upon the leaves of the present and previous seasons' growth, making a web upon the terminal shoots and reaching maturity the last week in June. They then pupate in the loose leaves of their improvised nests, and in a week the adults appear. The eggs are laid in midsummer and hatch in ten days. There is but one brood each year.

Where choice ornamental and shade trees are attacked, they should be sprayed thoroughly with lead arsenate, using at least five pounds of paste or two and one-half pounds of dry powder in fifty gallons of water.

A Chrysomelid Beetle on English Ivy Imported from Europe.—While inspecting imported nursery stock in the spring, Messrs. Caffrey and Kirk found in one box containing several plants of the common English ivy, *Hedera helix,* some blue leaf-eating beetles which appeared to be feeding upon the ivy. The shipment came from Holland. All specimens found were collected, about fourteen in number. Through the kindness of the Bureau of Entomology, these were identified by Mr. E. A. Schwarz as *Agelastica* (*Galeruca*) *alni* Linn. Mr. Schwarz writes that the introduction of this beetle into the United States would be most undesirable. Though perhaps it is not regarded as an important pest abroad, it is included in Eckstein's "Forstliche Zoologie," page 442, 1897, and in Judeich-Nitsche's "Forstinsektenkunde," page 607, 1895, as skeletonizing the leaves of various species of alder. Whether or not it will attack and injure other kinds of foliage we do not know.

Southern Cabbage Butterfly in Connecticut.—Mr. Walden captured an adult Southern cabbage butterfly *Pontia* (*Pieris*) *protodice* Boisdv., at Yalesville, September 26th, 1912, while inspecting nursery stock. This is the first Connecticut specimen taken by any member of the staff of this department, though our collection contains a male and a female collected by Mr. H. S. Woolley of Waterbury and the species has been reported from several other localities in the State. Smith, in his list of New Jersey Insects, states that the Southern cabbage butterfly is common in some seasons in Southern New Jersey, though rarely found in the northern part of the State. Messrs. Walden and Caffrey observed wings of this species in a spider's nest and several adults were flying about at Yalesville. No doubt this butterfly is more common than we suppose and is usually mistaken for the much more common imported cabbage butterfly, *Pontia* (*Pieris*) *rapæ* Linn. *P. protodice* is the cabbage butterfly of the Southern States and the caterpillars feed upon the leaves of cabbage, cauliflower and other cruciferous plants.

Tolype velleda Stoll., Unusually Common.—This curious moth is closely allied to the tent caterpillar and belongs to the family Lasiocampidæ, some members of which are called "lappet" or "lackey" moths in Europe. At two or three different times during the course of our gypsy moth work, the men have found the caterpillars, at first thinking they were gypsy caterpillars, then noticing the difference. The caterpillars are very short and broad and are closely appressed to the bark, dull rusty or dark grey in color. The first specimen received at this office on July 27th, 1912, was a full grown larva from Centerhill, in the town of Hartland. On October 5th Mr. Stoddard of the botanical department brought in an adult collected in New Haven, and early in October the writer observed several of the moths resting on electric light poles about the city. On October 11th a box containing eight adults and three cocoons were received from Leonard Bridge in the town of Lebanon. The moths are grey and have a wing-spread varying from one and one-half inches in the male to two and one-fourth in the female. The primaries are crossed by white, undulating lines. The bodies have a woolly appearance, and are grey with a brown central stripe extending the length of the thorax. The caterpillars fed upon apple, pear, cherry, maple, oak, willow, poplar and lilac, and will probably never be sufficiently common to be regarded as a pest.

The Elm Saw-fly.—This insect was rather abundant in 1912 and larvæ were observed in several places. On July 31st, a larva was received from Winsted, and on September 19th, three larvæ on willow were handed to the writer at Norfolk. The full grown larva is over an inch and a half long, head and body uniformly a light cream color with black spiracular dots and a narrow black or dark brown median dorsal stripe. (See plate IX, c.) The larvæ may be seen in the latter part of summer crawling down the trunks of elm, willow, poplar and linden trees, upon which they feed, seeking the ground to transform. Spraying the foliage with lead arsenate is the proper remedial treatment. If disturbed they curl themselves up like a snail shell. The adult is one of our largest saw-flies, also called "willow" or "giant" saw-fly and bears the name of *Cimbex americana* Leach.

Aphis on Potatoes.—On July 18th leaves of corn and potatoes were received from Mr. Noyes Palmer of Stonington, and from Mr. Alfred L. Beebe of Mystic, all infested with aphids which we took to be the potato aphid *Macrosiphum* (*Nectarophora*) *solanifolii* Ashm. This identification was later verified by Mr. Arthur I. Bourne of the Agricultural Experiment Station, Amherst, Mass. In 1903 this aphid was very abundant on leaves and stems of potatoes in Fairfield, and in July, 1909, Mr. Bourne, then an assistant in this department, found it on potatoes in the Station garden. In 1904 and the two succeeding years it caused serious damage in the large potato fields of Aroostook County, Maine, and Bulletin 147 of the Maine Experiment Station, by Dr. Edith M. Patch, is devoted to this species. Where plants are badly infested in small areas we may employ a spray of kerosene emulsion, but this did not seem practicable on large areas in Maine.

Tulip Tree Scale, *Toumeyella liriodendri* Gmel.—This is our largest scale insect. It is now attracting considerable attention and specimens were received during the season from Columbia, Fairfield, Greenwich, New Haven and Waterford. The female scales are hemispherical, nearly one-third of an inch in diameter and brown in color. They are usually found upon and sometime kill the lower branches of tulip trees, afterward going to the higher branches. Small trees are often wholly infested. The males are much smaller and thinner. There is one brood annually, the young being born about September 1st. The proper treatment is to spray with kerosene emulsion during the latter part of September to kill the young. The old shells remain for a long time upon the twigs. Formerly this insect was placed in the genus *Lecanium*, and later was known as *Eulecanium tulipiferæ* Cook.

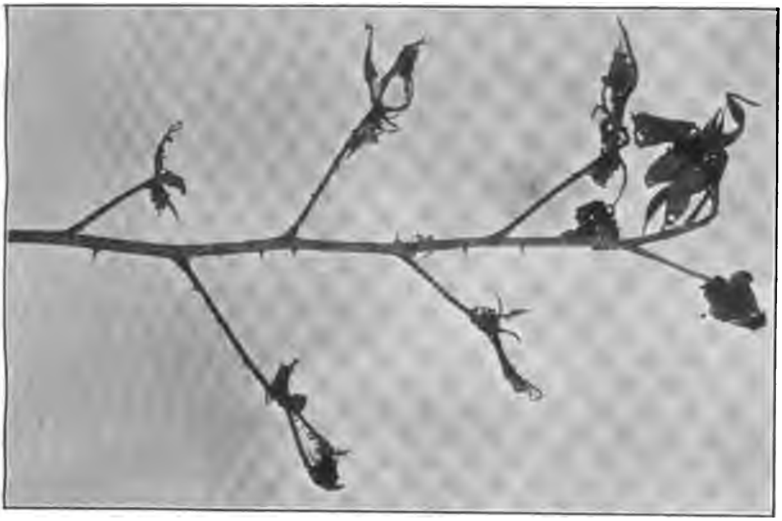
Juniper Web Worm, *Phalonia rutilana* Hubn.—On May 21st red cedar twigs were received from Wilton, containing a number of small webs. Though adults were not reared, the webs were probably formed by the Juniper web worm, which is described and illustrated by Packard in the Fifth Report, United States Entomological Commission, page 910, 1890. On November 4th, 1909, similar webs on dwarf juniper were sent to us from Greenwich. If choice or ornamental trees or shrubs are endangered a spray of lead arsenate will doubtless prevent further devastation.

The Garden Millipede or "Thousand Legs," *Julus hortensis* Wood.—On May 13th I was called to examine strawberry plants in a large field near New Haven. There were many dead plants, some no doubt having been injured the previous winter. The plants showed considerable tunneling in the main stems, probably the work of the strawberry crown borer *Tyloderma fragariæ* Riley, though only a few of the larvæ were present at the time of the examination. Many of the cavities, however, were literally filled with these millipedes (shown on Plate XVI, a, and b), apparently eating into the roots and crowns. In fact many of the cavities may have been eaten by them as they were very abundant on the field. At various times these millipedes have been sent to the Station, and reported as causing injury to plants. In Guilford in 1907 they damaged roots and bulbs in flower beds; in New Haven French anemones were injured by them in 1909, and beans in 1911.

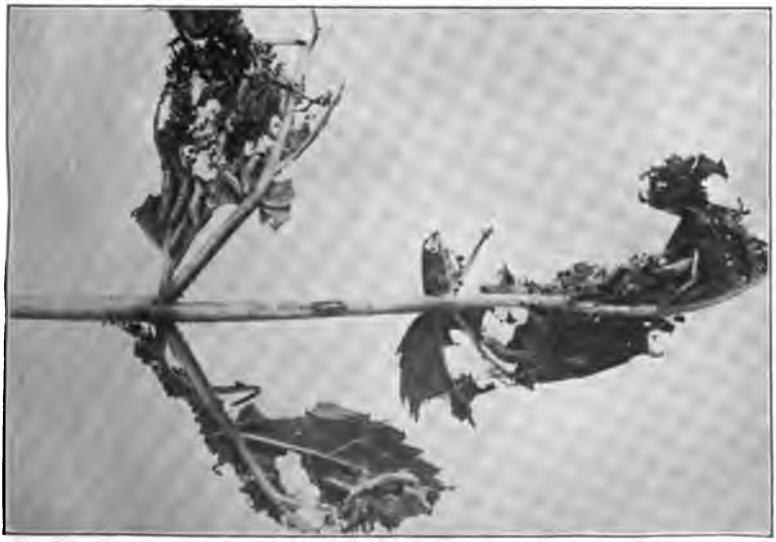
The remedies consist of poisoned baits, such as slices of potato, turnip or some other succulent root, dipped in a mixture of lead arsenate, white arsenate or Paris green, about an ounce of dry powder or twice as much lead arsenate paste to two gallons of water. The bait should be distributed over the infested portions of the field.

Mites on Ash Tree.—On August 27th I was called to examine a white ash tree on Huntington Street, New Haven, opposite the Station grounds. The tree was perhaps six inches in trunk diameter, and it was literally covered, not only on leaves and stems, but on the bark of branches and trunk, with a silk-like web upon which were crawling myriads of mites resembling the common red spider of greenhouses. This web was so thick on the bark that it glistened in the sunlight as if covered with ice, though somewhat iridescent. The mites were fairly swarming down the trunk, evidently migrating to another tree, or perhaps to lay their eggs elsewhere. The leaves, which were badly injured, were turning yellow and dropping, the drought probably increasing or aggravating the trouble. Slides of these mites were sent to Mr. Nathan Banks, of the Bureau of Entomology at Washington, who identified the species as *Tetranychus bimaculatus* Harv.

Mites on Chrysanthemum Flowers.—On November 14th, Mr. Kirk, when inspecting imported nursery stock at a florist's in Bridgeport was asked to examine some chrysanthemums which drooped and the petals withered and died. In a large flower, though freshly cut, dead and brown petals scattered through the blossom at once indicated that something was wrong. Though examined by both botanists and entomologists, the only parasites found were very small mites at the base of the petals. The mites seemed to be the cause of the trouble and were determined by Mr. Banks as *Tarsonemus pallidus* Banks.

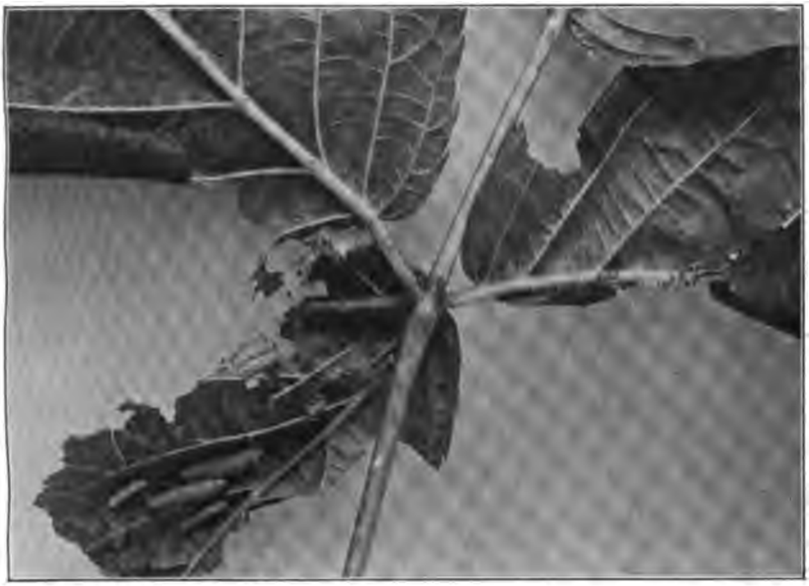


a. Blackberry cane nearly defoliated.

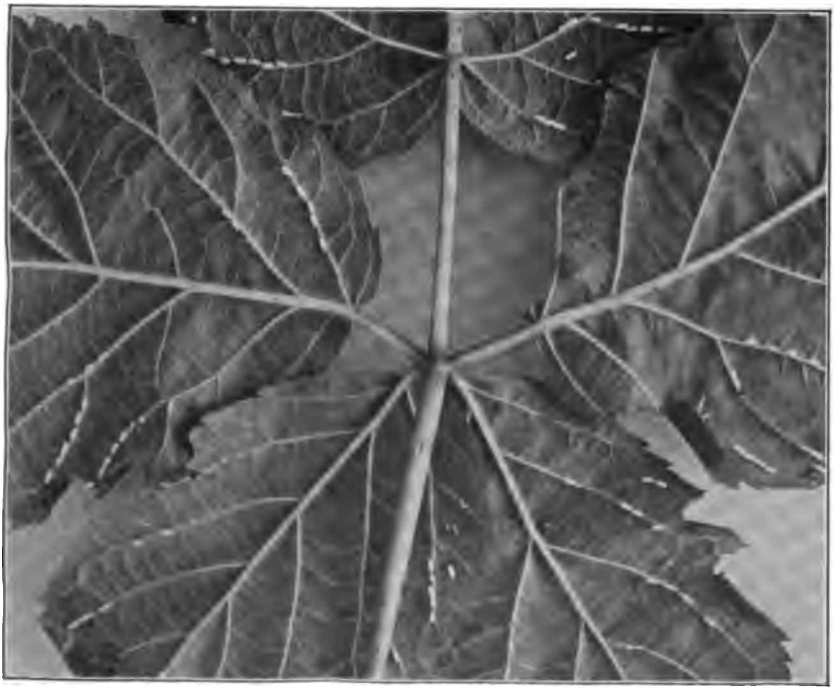


b. Larvæ on leaf. Natural size.

WORK OF BLACKBERRY SAWFLY.



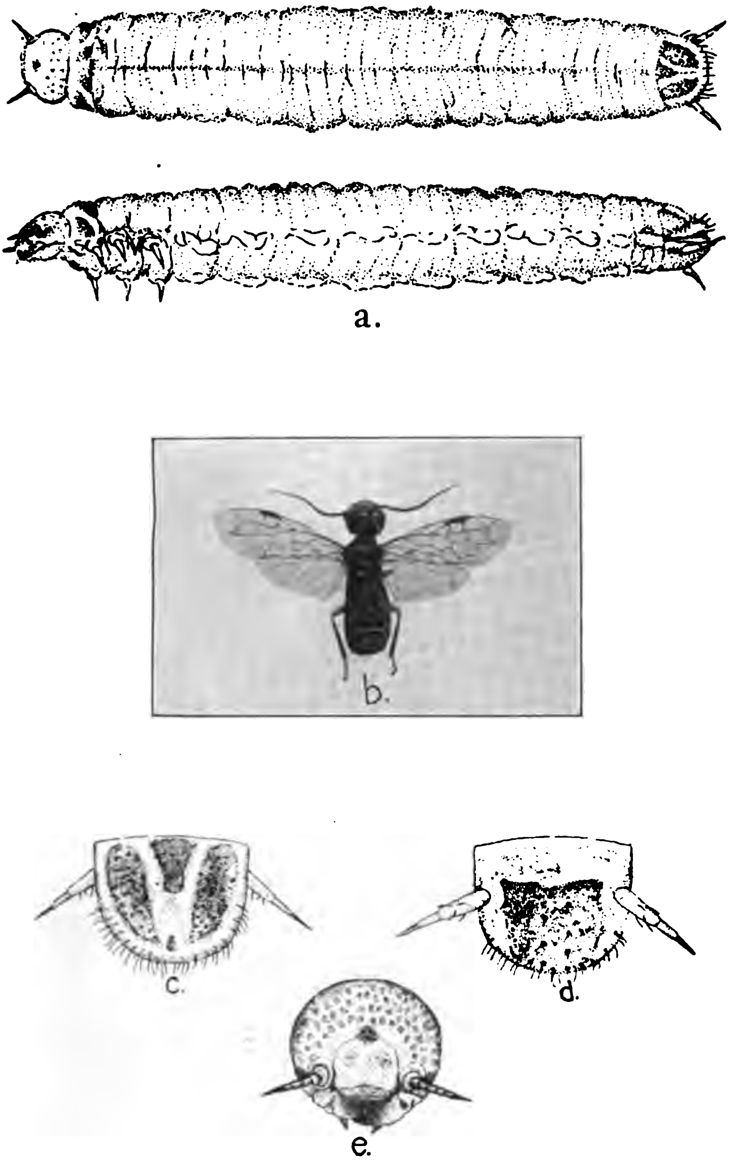
a. Leaf rolled by larvæ. Natural size.



b. Eggs on under side of leaf. Natural size.

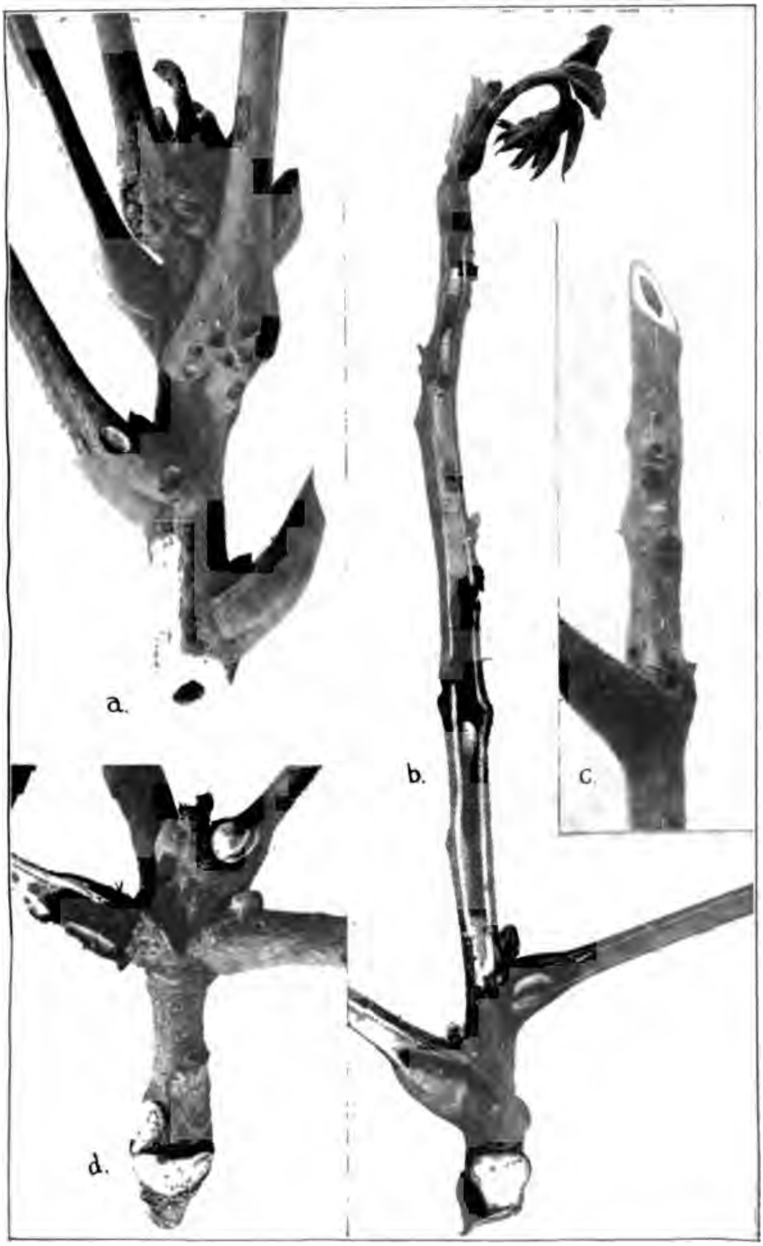
EGGS AND LARVÆ OF BLACKBERRY SAWFLY.

PLATE III.



a. Larvæ, about five times enlarged. b. Adult, twice natural size. c. Dorsal view of last segment of larva. d. Ventral view of same. e. Face of larva—last three ten times enlarged.

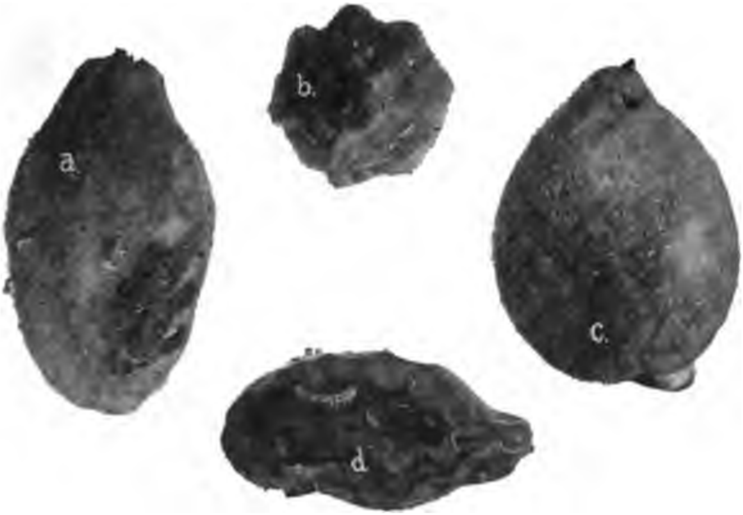
LARVÆ AND ADULT OF BLACKBERRY SAWFLY.



a. Feeding punctures at base of leaf petioles. b. Larvæ tunneling in new shoot. c. Shows where frass is ejected through egg punctures. d. Hickory probably attacked by this insect. All natural size.

WORK OF WALNUT WEEVIL.

PLATE V.

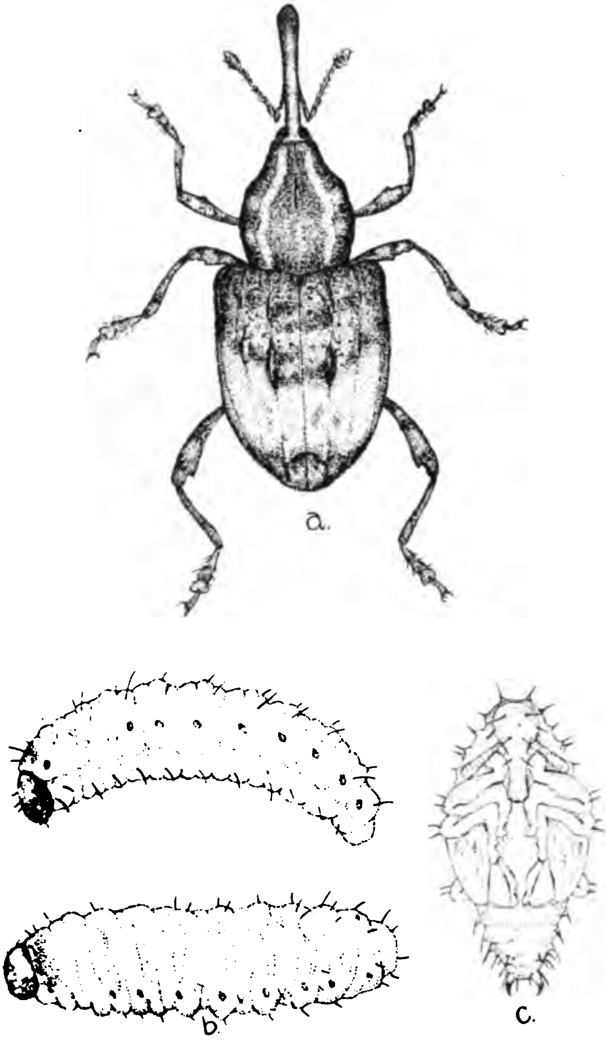


a. Appearance of infested butternut. b. Shows where grub had entered at end of butternut. c. Walnut showing egg puncture at tip. d. Grub inside of butternut. All natural size.

e. Small walnut tree showing method of studying the habits of the weevil.

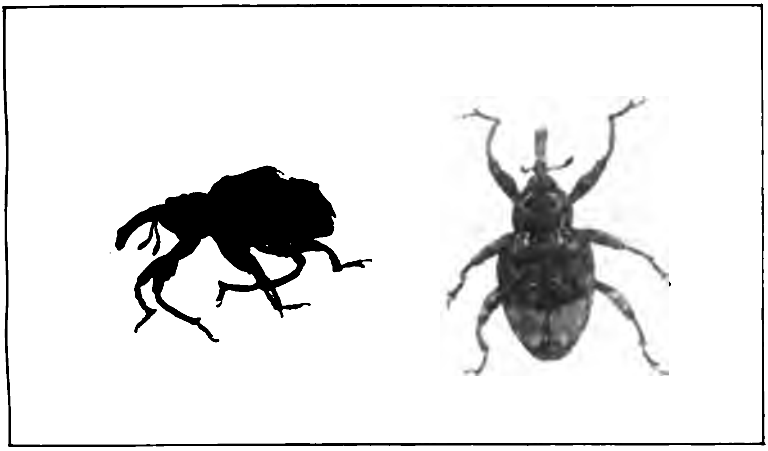
WORK OF WALNUT WEEVIL.

PLATE VI.

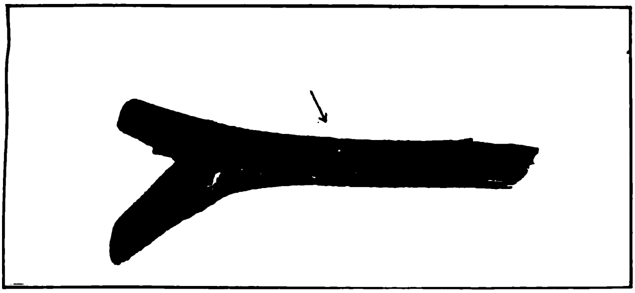


a. Adult. b. Larvæ. c. Pupa. All greatly enlarged.

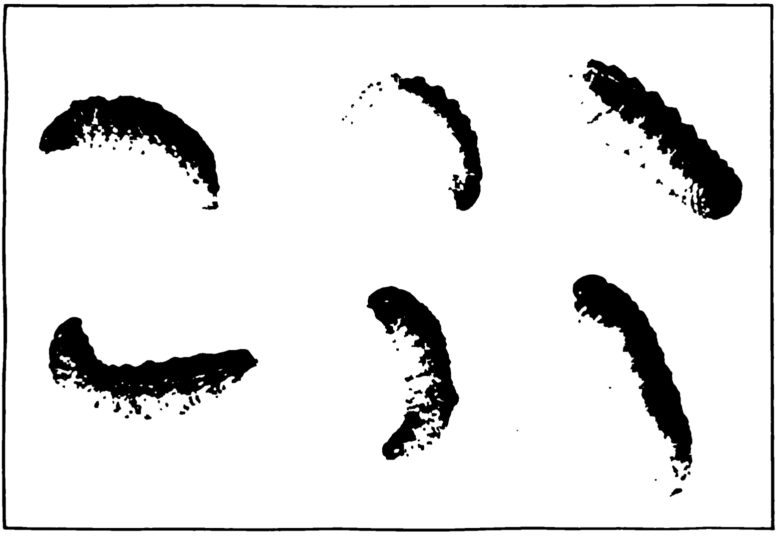
ADULT, LARVÆ AND PUPA OF THE WALNUT WEEVIL.



a. Walnut weevils. Four times natural size.

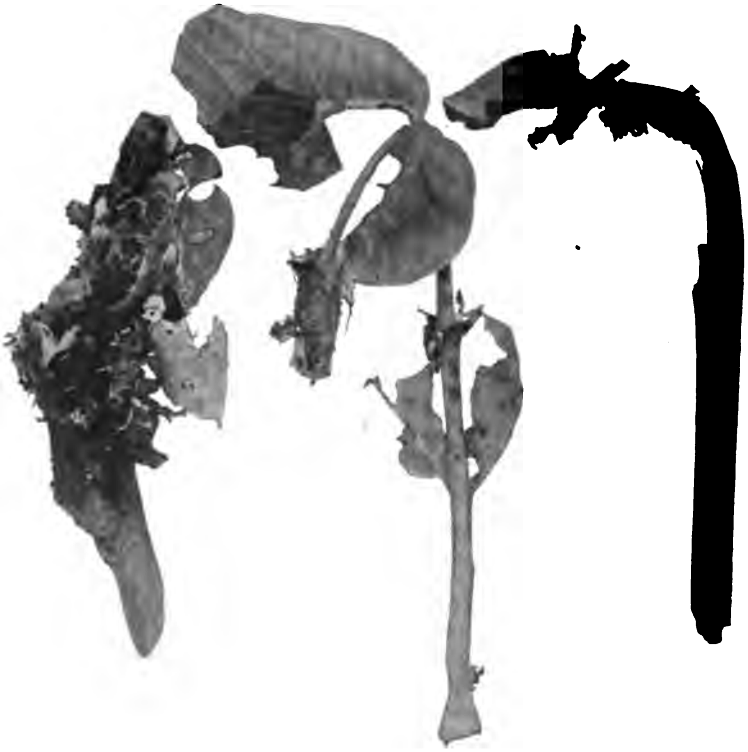


b. Egg as laid in stem. Natural size.

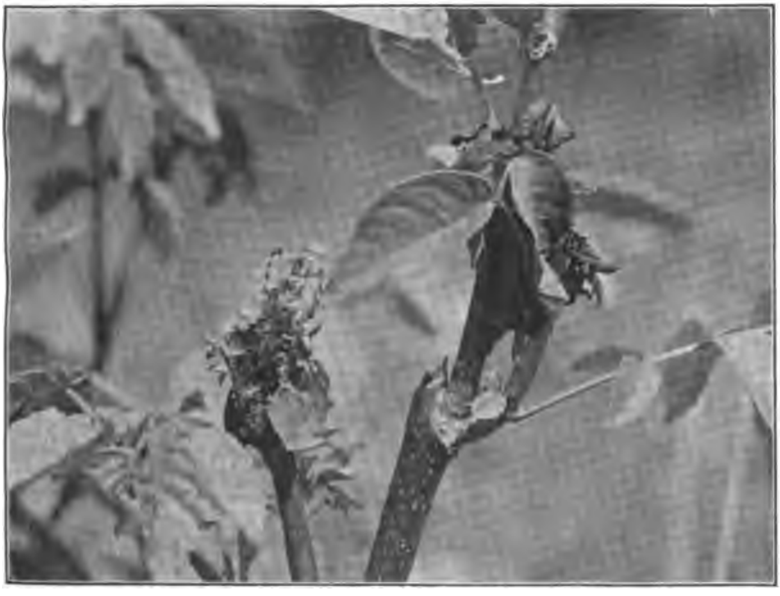


c. Larvæ. About two and one-half times natural size.

EGG, LARVÆ AND ADULTS OF WALNUT WEEVIL.

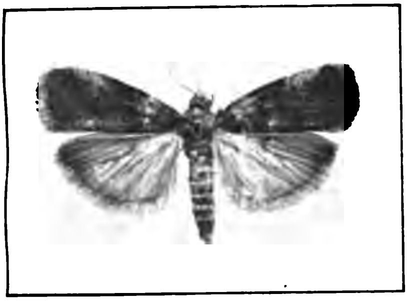


a. Nests at tips of new growth. Natural size.

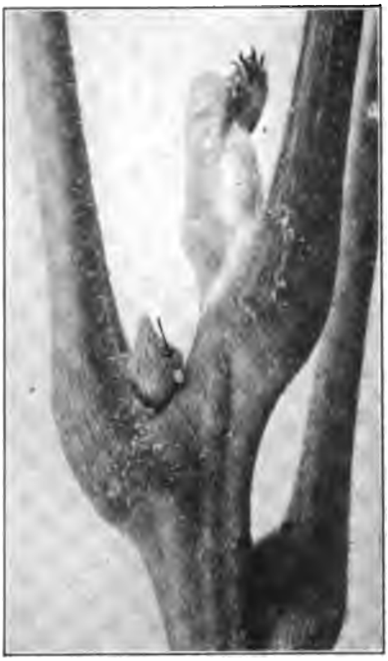


b. Appearance of infested shoots, natural size.

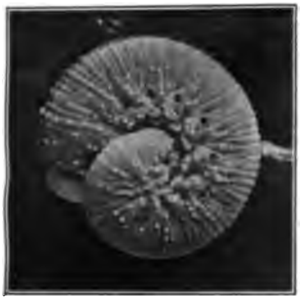
WALNUT BUD MOTH.



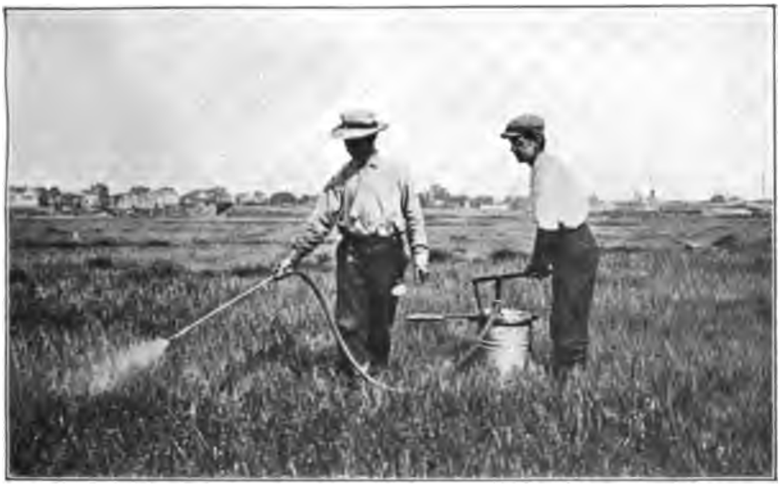
a. Walnut Bud Moth, twice natural size.



b. Arrow shows egg of Bud Moth. Enlarged two and one-half times.

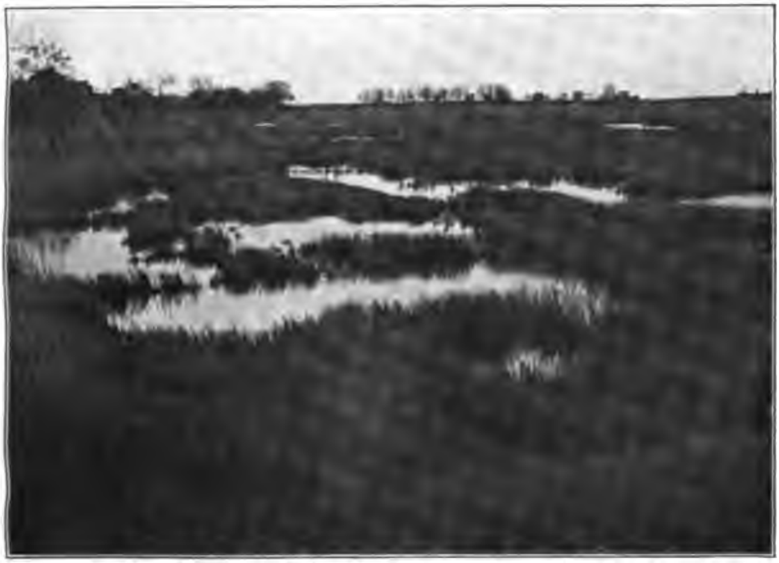


c. Larva of Elm Sawfly. About twice natural size.

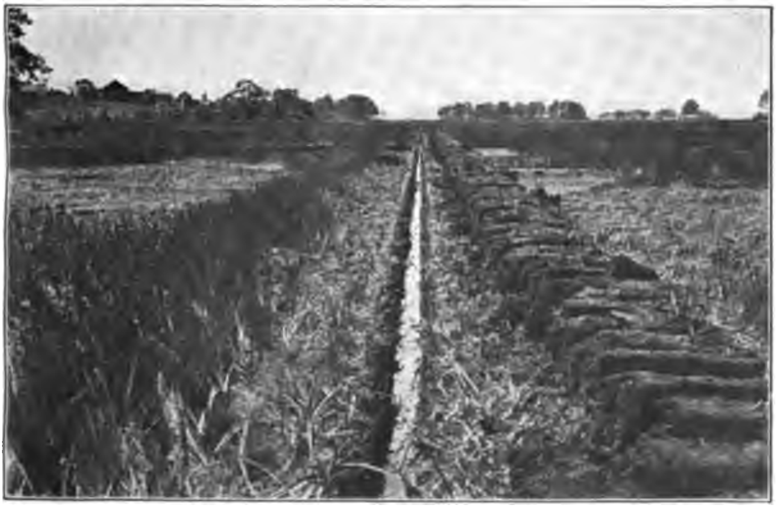


d. Oiling mosquito breeding pools with the "Double Forester" pump.

WALNUT BUD MOTH, ELM SAWFLY AND METHOD OF OILING MARSHES.

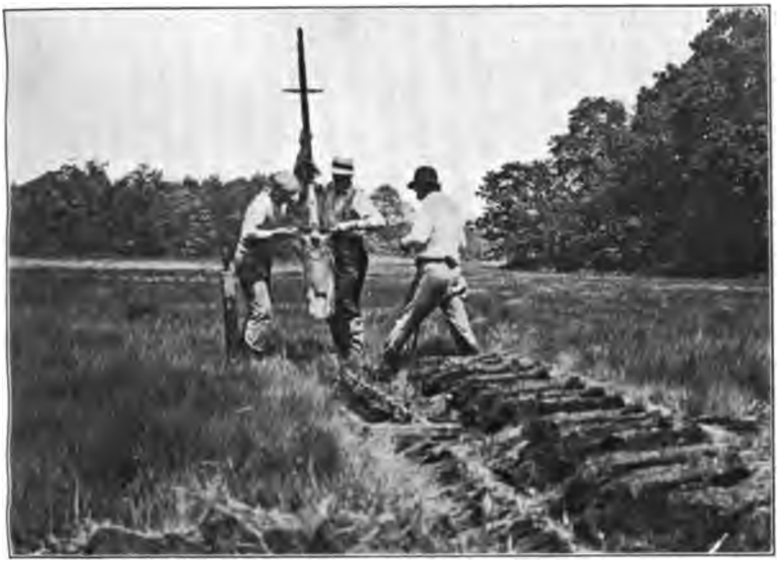


a. Mosquito breeding pools on salt marsh near Morris Cove.

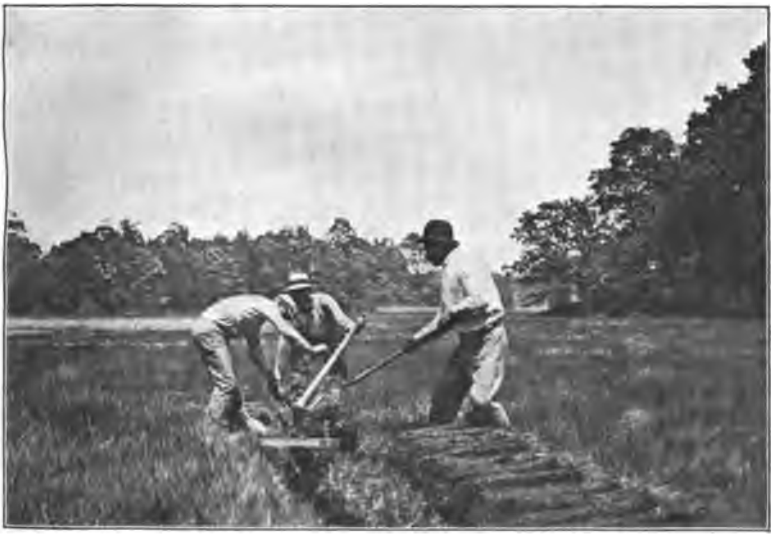


b. The same view as above showing ditch.

MOSQUITO DRAINAGE ON THE SALT MARSH.

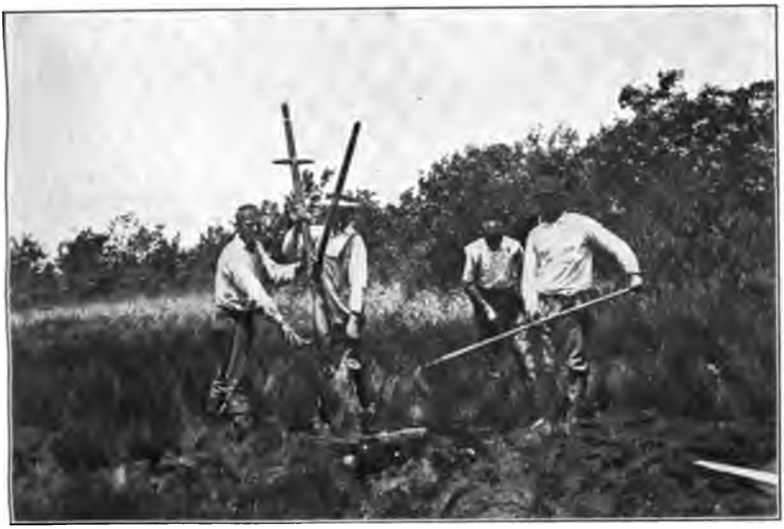


a. The spade raised ready to be plunged into the peat.



b. Rolling away the turf.

DRAINING THE SALT MARSH WITH THE SKINNER SPADE.



a. The Skinner ditching spade.

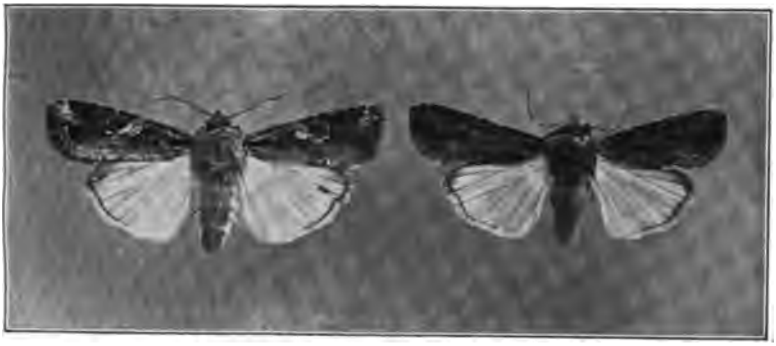
b. This pool half way between ditches has been drained.

DRAINING OF SALT MARSHES.

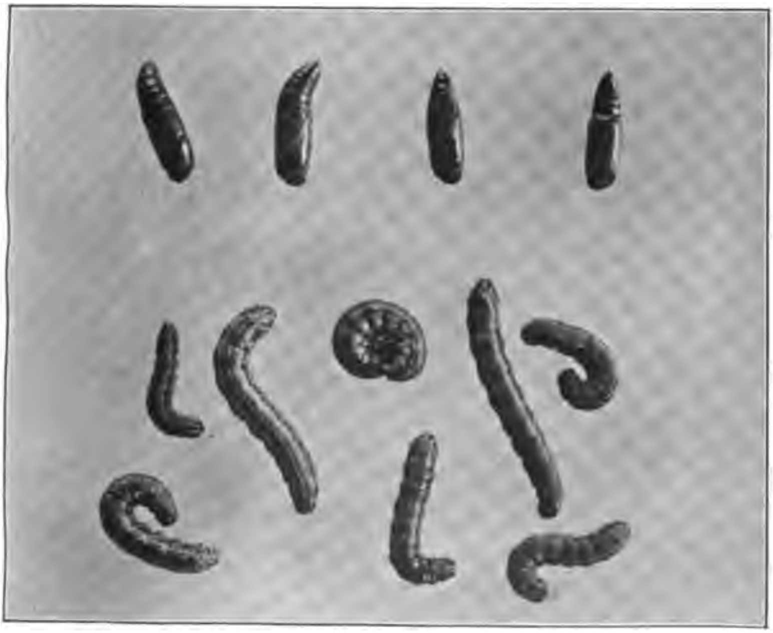
a. Sandy Point marsh. Stakes and flags mark breeding pools.

b. Oiling pools in West River marsh.

OILING BREEDING POOLS WITH "AUTO-SPRAY" OUTFITS.



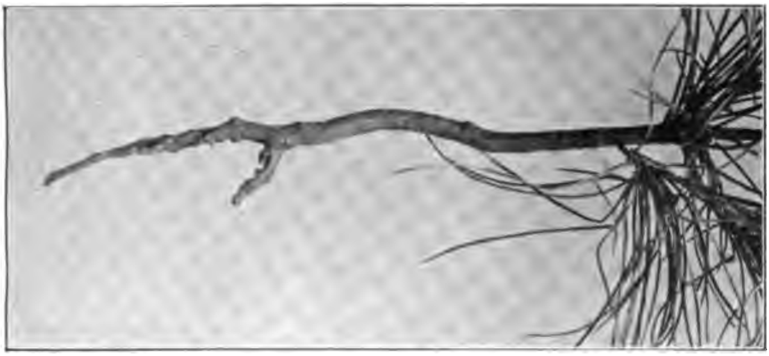
a. Adults, female at left. Somewhat enlarged.

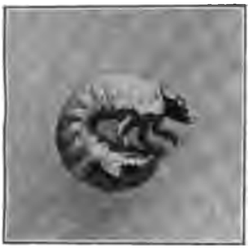


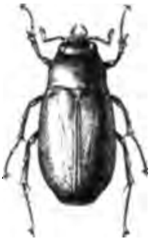
b. Larvæ and pupæ, natural size.

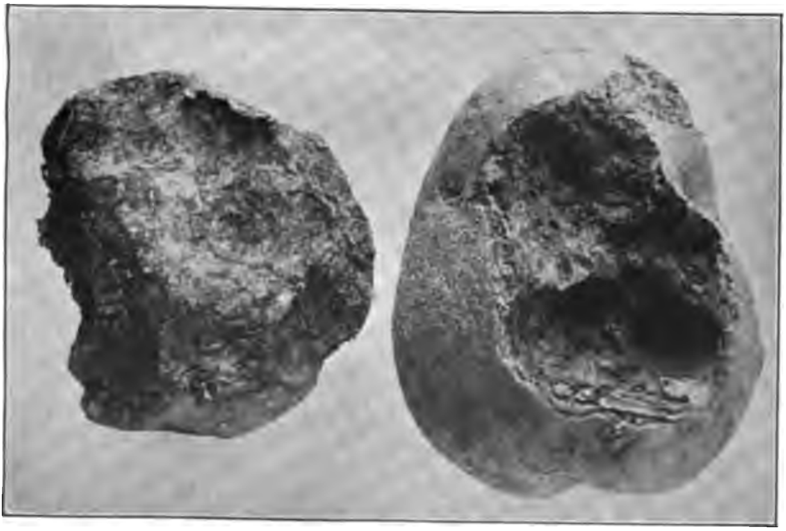
THE FALL ARMY WORM.

PLATE XV.


a. Seedling pine eaten off by grubs. Natural size.

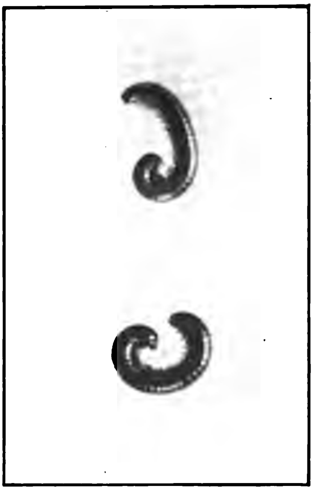

b. White grub.
Natural size.


c. Adult June
beetle, natural
size.

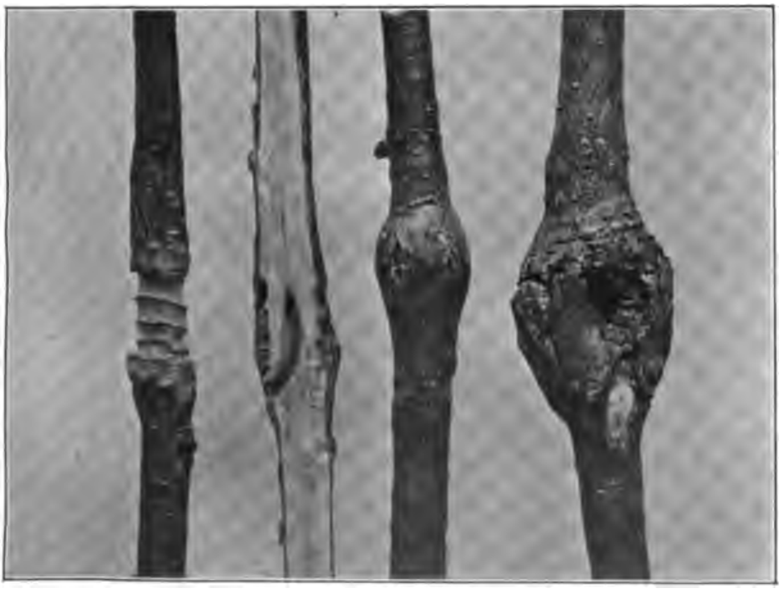

d. Potatoes eaten by white grubs.

THE WHITE GRUB.

a. Strawberry stem where millipedes were found.



b. Garden millipedes, natural size.



c. Galls of *Agrilus champlaini* on hop hornbeam.

GARDEN MILLIPEDE AND A BORER IN HOP HORNBEAM.

PART IV.

Commercial Feeding Stuffs.

By J. P. Street.*

THE LAW REGULATING THEIR SALE.

Under the Connecticut statutes the term "concentrated commercial feeding stuff" covers practically all feeds *excepting*:—hay and straw, whole seeds, unmixed meal made directly from any one of the cereals or from buckwheat, and feed ground from whole grain and sold directly from manufacturer to consumer.

Section 4592 requires that every package of concentrated commercial feeding stuff shall bear a statement giving the name and address of manufacturer or importer, the number of net pounds in the package, the name of the article and the percentage of protein and fat contained in it.

No registration of feeds or payment of analysis or license fees is required.

The penalty for violation of the statute is not more than $100 for the first offense and not more than $200 for each subsequent offense.

The law authorizes this station to take samples from any manufacturer, or dealer, in a prescribed fashion, and requires the station to analyze, annually, at least one sample of each brand which it has collected and to publish these analyses "together with such additional information in relation to the character, composition and use thereof as may be of importance."

The dairy and food commissioner is charged with the enforcement of the statute.

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* The analytical work here described has been done by Messrs. Bailey, Morrison, Roe and Shepard.

In compliance with these requirements the following report has been prepared. The utmost brevity of discussion is made necessary by the limit imposed by law on the size of the report.

During the fall of 1912 the station sampling agent visited fifty towns and villages of this State and collected 226 samples of feeds as prescribed by law. The results of the examination of these samples are here discussed, and the chemical analyses are given in Table V.

The fifty-five analyses of samples sent by individuals are separately reported.

OIL SEED PRODUCTS.

Cotton Seed Meal, Sampled by the Station.

(ANALYSES ON PAGE 318.)

Of the seventeen samples analyzed all satisfied their guaranties except **1237**, from the Kemper Mill & Elevator Co., Kansas City, and **1267**, from W. Newton Smith, Baltimore, Md., which were 2.75 and 3.37 per cent. low in protein, respectively. The average composition and selling price were practically the same as last year.

Cotton Seed Meal, Sampled by Purchasers.

The station is not responsible for the sampling but only for the analyses of samples not drawn by its agents.

Four brands of *Dixie Brand,* Humphreys, Godwin & Co., Memphis, were uniformly guaranteed 38.62 per cent. protein. **124,** sent by O. T. Downs, Brooklyn, contained 41.12 per cent.; **1085,** sent by L. C. Brainard & Co., Thompsonville, 41.19 per cent.; **1456,** sent by H. B. Coger, Newtown, 39.50 per cent.; and **1474,** sent by C. A. Pease & Co., Hartford, 42.50 per cent. This low guaranty is "safe" for the seller, but not exact enough for the buyer.

Two other samples, likewise credited to Humphreys, Godwin & Co., and sent by W. R. Messenger, Granby, were guaranteed 6.5 per cent. nitrogen, which is equivalent to 40.63 per cent. protein. **1482** contained 40.38 and **1483,** 36.69 per cent. protein, the latter being deficient by nearly 4 per cent.

Four other samples of Humphreys, Godwin & Co.'s meal came to us unguaranteed. **107** and **1485,** sent by The Coles Co., Middletown, contained 40.38 and 39.50 per cent. protein, respectively; **1486** and **1649**, sent by Olds & Whipple, Hartford, contained 38.38 and 40 per cent., respectively.

23 and **56**, *Owl Brand,* F. W. Brode & Co., Memphis, sent by B. T. Holcomb, West Simsbury, and R. L. Forsyth, Granby, the latter sample guaranteed 41 per cent. protein, contained 41.30 and 41.56 per cent., respectively.

328, W. Newton Smith, Baltimore, Md., guaranty 41 per cent. protein, sent by M. D. Leonard & Co., Watertown, contained 36.44 per cent., a deficiency of 4.56 per cent.

329, R. J. Hardy & Sons, Boston, guaranty 38 per cent. protein, sent by M. D. Leonard & Co., Watertown, contained 39.75 per cent.

1076 and **1459**, sent by The Coles Co., Middletown, contained 37.81 and 39.56 per cent. protein, respectively.

1451, *Bonita Brand,* Southern Cotton Oil Co., Charlotte, N. C., guaranty, 38.62 per cent. protein, sent by Apothecaries Hall Co., Waterbury, contained 40.88 per cent.

1470, bought through Apothecaries Hall Co., Waterbury, by H. H. Waldron, Bethlehem, contained 38.50 per cent. protein.

1473, sent by W. H. Lee, Orange, contained 42.50 per cent. protein.

1647, Southern Cotton Oil Co., Charlotte, N. C., sent by Apothecaries Hall Co., Waterbury, contained 41.75 per cent. protein.

Linseed Meal, Sampled by the Station.

(ANALYSES ON PAGE 318.)

The two samples of new process and the three of old process meal all satisfied their guaranties.

Peanut Meal, Sampled by Purchasers.

Two samples of peanut meal and two of peanut waste were analyzed. **21** was sent by J. W. Pincus, New York; **880**, J. E. Soper Co., Boston, sent by F. H. Stadtmueller, Elmwood; **30**, sent by Nut Product Co., New Haven; and **125**, sent by T. S. Scranton, Madison. These samples had the following composition:

	Peanut Meal.		Peanut Waste.	
	21	880	30	125
Water	—	8.09	3.57	4.85
Ash	—	—	5.77	5.66
Protein	34.94	46.25	28.44	22.44
Fiber	—	—	3.61	7.14
Nitrogen-free extract	—	—	19.23	31.93
Fat	—	8.87	39.38	27.98

880 was guaranteed 38 per cent. protein and 8 per cent. fat, selling price, $32.00, or $4.00 less per ton in car lots. This sample far exceeded its protein guaranty, and would seem to be an economical purchase at the price quoted, provided it proved acceptable to stock. Experience indicates that too much of this product scours dairy stock. None of the other samples was guaranteed, or was the selling price given.

WHEAT PRODUCTS.

Wheat Bran.

(ANALYSES ON PAGE 318.)

Of the twenty-six samples, five had no guaranty of composition as required by law, and two of these no brand name. These samples were **1258**, *Hamilton's Winter Bran,* **1161**, *Niagara Bran,* **1318**, *Voigt's Bran,* and **1221** and **1284**, manufacturer unknown. These samples were of normal quality, but this in no wise relieves the Connecticut dealer from the obligations of the law regarding branding. Of the remaining twenty-one samples, all but two satisfied their guaranties, **1149**, *Hecker's Choice Bran,* and **1295**, *Western Canada Flour Mills Bran,* being 0.65 and 0.52 per cent. deficient in fat, respectively.

The selling price ranged from $25 to $30, the higher prices as a rule providing no better feed.

Wheat Middlings.

(ANALYSES ON PAGE 320.)

Of the thirty-one samples, **1319**, *Voigt's Middlings,* and **1165**, *Standard Middlings,* did not bear the guaranty required by law, but were of good quality. **1176**, *Cox's Middlings,* was 1.09 per cent. below guaranty in fat, **1233**, *Hecker's H Middlings,* was

0.86 per cent. below in fat, and **1247**, *Lidgerwood Middlings,* was 1.50 per cent. below its protein guaranty. **1148** contained an unusual amount of fiber, probably due to imperfect cleaning of the wheat.

The selling prices ranged from $27 to $36 per ton, an even wider range than in the case of wheat bran. There is no important difference in composition between samples selling at these extreme prices.

Wheat Feed.

(ANALYSES ON PAGE 322.)

Of the twenty-four samples, **1167**, *Bull's Eye Mixed Feed,* was 1.19 per cent. below its protein guaranty, and **1313**, *Manhattan Mixed Feed,* was 0.78 per cent. below in fat.

The selling price ranged from $28 to $34 per ton, the $28 sample containing more protein than that sold for the maximum price.

Red Dog Flour.

(ANALYSES ON PAGE 324.)

The three samples analyzed satisfied their guaranties.

Wheat Products, Sampled by Purchasers.

904, *Bran,* bought of Waters and Bronson, Middlebury, and sent by H. E. Clark, Middlebury, guaranty 14.5 per cent. protein, contained 15.06 per cent. **1472**, *Bran,* sent by W. H. Lee, Orange, contained 15.69 per cent. protein.

MAIZE PRODUCTS.

Gluten Meal.

145, *Diamond Gluten Meal,* C. M. Cox & Co., Boston, sent by C. N. Burnham, Middlefield, contained 39.25 per cent. protein.

Gluten Feed.

(ANALYSES ON PAGE 324.)

Ten samples of six brands were analyzed, all of which satisfied their guaranties, the average protein, 25.83 per cent., exceeding the average guaranty by nearly 3 per cent.

Five samples were sent by purchasers: **146**, *Buffalo,* sent by C. N. Burnham, Middlefield, contained 25.94 per cent. protein;

128, *Globe,* sent by S. P. Woodward, Bethany, contained 30.94 per cent. protein; **892,** *Danbury A,* and **893,** *Danbury B,* sent by R. J. Hardy & Sons, Boston, contained 25.88 and 25.38 per cent. of protein, respectively; and **1471,** sent by W. H. Lee, Orange, contained 26.88 per cent. protein.

Hominy Feed.

(ANALYSES ON PAGE 326.)

Of the fifteen samples analyzed, one, **1306,** Simpson, Hendee & Co., New York, did not bear the guaranty required by law; this sample, however, was of excellent quality. The other fourteen samples all satisfied their guaranties. The average hominy feed this year contained 0.74 per cent. more protein, and 0.43 per cent. more fat than in 1911, and sold for $2.53 per ton less.

54, *Yellow Hominy Feed,* Quaker Oats Co., Chicago, guaranty 9 per cent. protein, sent by F. D. Weed, Danbury, contained 10.25 per cent. protein; **55,** *Steam Cooked Hominy Feed,* Miner-Hillard Milling Co., Wilkes Barre, Pa., guaranty 10 per cent. protein, also sent by Mr. Weed, contained 11.44 per cent. protein.

1087, sent by W. C. Burton, Torrington, was suspected by the purchaser of being adulterated. It contained 10.36 per cent. water, 2.00 ash, 8.75 protein, 2.94 fiber, 69.53 nitrogen-free extract and 6.42 fat. The deficiency in protein and fat appeared to be due only to the presence of excessive starch, corn starch being the only starch shown by the microscope.

1652, sent by H. B. Peck, Northfield, contained 11.06 per cent. protein.

Hominy Feed and Corn Cob.

(ANALYSIS ON PAGE 326.)

The single sample of *Star Feed* analyzed exceeded its protein guaranty by more than 3 per cent. and its fat guaranty by more than 2 per cent. However, compared with hominy feed at $28, or even $30, it is not an economical purchase, as it contains more fiber and less protein, fat and carbohydrates than standard hominy feed.

Corn Bran.

One sample, **195,** sent by D. H. Colt, Elmwood, contained 9.19 per cent. protein.

RYE PRODUCTS.

(ANALYSES ON PAGE 326.)

Two samples of rye feed and one each of rye bran and rye middlings were analyzed. **1151,** *Bran,* ground by Morse and Landon, Guilford, did not bear the guaranty required by law. It contained less protein and fat and considerably more starch than the other three rye products, all of which satisfied their guaranties.

BUCKWHEAT PRODUCTS.

(ANALYSES ON PAGE 328.)

The two samples of middlings analyzed were of quite different quality. In **1342,** *Quinebaug Middlings,* the protein was 2.37 per cent. below its guaranty and 0.54 below its fat guaranty, although the product was very high grade. The other sample of somewhat poorer quality satisfied its guaranty.

OATS.

Three samples of oats, **930, 931** and **932,** sent by Joseph Pepe, Waterbury, contained 12.59, 12.72 and 13.14 per cent. of water, respectively. We were asked to determine whether these were old-crop or new-crop oats. A considerable difference in water-content might have given some indication, but the differences in these samples are too small to be significant.

BARLEY PRODUCTS.

Malt Sprouts.

(ANALYSES ON PAGE 328.)

Of the three samples analyzed, **1144,** *Flint's Fancy Marvel,* was 0.73 per cent. below its fat guaranty, and **1169,** *Geneva Malting Co's Malt Sprouts,* was 0.98 per cent. below in fat. **1144,** however, exceeded its protein guaranty by 6.25 per cent., and was a sample of very high grade. **1317,** *Ballantine's Malt Sprouts,* was 1.13 per cent. low in protein. It contained a rather undue amount of barley hulls. The three samples averaged 26.55 per cent. protein, with an average selling price of $28. This feed should receive more consideration from dairymen, especially in comparison with many of the proprietary mixed feeds containing only from one-third to one-half as much protein as malt sprouts, and selling for from $30 to $35 a ton.

Dried Brewers' Grains.

(ANALYSES ON PAGE 328.)

All of the four samples analyzed satisfied their guaranties. Attention is again called to the fact that this feed is frequently underguaranteed in protein. The samples averaged 27.89 per cent. protein and 6.86 per cent. fat, exceeding the respective average guaranties by 3.39 and 1.18 per cent. The average price, $29.75 per ton, considered in connection with the feed's high analysis, marks it as one of the cheapest high-grade feeds on the market.

Dried Distillers' Grains.

(ANALYSES ON PAGE 328.)

The three samples analyzed all satisfied their guaranties. Though not as cheap a feed as either malt sprouts or dried brewers' grains, this feed is valuable and economical, especially when compared with proprietary feeds selling for the same price.

MISCELLANEOUS FEEDS.

Dried Beet Pulp.

(ANALYSES ON PAGE 328.)

The five samples of beet pulp satisfied their guaranties. This material is a carbohydrate rather than a protein feed. Feeding experiments in other states, notably New Jersey, have demonstrated its value, as its carbohydrates appear to be present in a very assimilable form.

Dried Molasses Beet Pulp.

(ANALYSIS ON PAGE 330.)

The single sample analyzed satisfied its guaranty. **22**, made by The Larrowe Milling Co., Detroit, and sent by The C. W. Campbell Co., Westerly, contained 10.06 per cent. protein.

Corn, Oats and Barley.

(ANALYSES ON PAGE 330.)

This material is exempt from the provisions of the law with respect to guaranty. The two samples analyzed were of very similar composition and were of standard quality.

Wheat and Corn Cob Feeds.

(ANALYSES ON PAGE 330.)

Both samples were properly branded and both satisfied their guaranties. The price of this class of feeds is more reasonable than in past years. It is for the feeder to determine whether he shall buy a wheat feed at $28 to $30, or such a feed as this in which the protein of wheat feed has been reduced from 17 to 11 per cent. by an admixture of ground corn cobs, and which sells for $24 or $25 per ton.

Corn and Oat Feeds.

(ANALYSES ON PAGE 330.)

Two samples of true provender (ground corn and oats) were analyzed and both were of good quality.

Chop Feeds.

(ANALYSES ON PAGE 330.)

The thirteen samples analyzed satisfied their guaranties. Chop feeds are chiefly mixtures of corn and oats products, with sometimes a little hominy. A mixture of corn and oats of good quality, half and half, should contain about 10 per cent. protein, 4.5 per cent. fat, and not over 5.5 per cent. fiber. A comparison of these figures with the analyses shows that inferior portions of these grains, corn cob and oat hulls, are often present in more than normal proportions. It is difficult to understand why any one buys such feeds as these when cotton seed meal, gluten feed, dried brewers' grains, malt sprouts, and dried distillers' grains may be bought for the same price or less, and when an abundant supply of carbohydrates and roughage can be cheaply raised on the farm.

Proprietary Horse Feeds.

(ANALYSES ON PAGE 332.)

Six samples were analyzed. **1234,** *Bonnie Horse Feed,* was 1.00 per cent. below its protein guaranty. The other samples all satisfied their guaranties.

A sample of *Sucrene Horse & Mule Feed,* **19,** American Milling Co., Chicago, sent by H. B. Coger, Botsford, contained 13.13 per cent. protein.

Proprietary Dairy and Stock Feeds.

(ANALYSES ON PAGE 332.)

Twenty-two samples were analyzed. The following deficiencies in fat were found: **1223,** *Biles' Ready Dairy Ration,* 0.48 per cent.; **1281,** *Blatchford's Calf Meal,* 0.28 per cent.; **1332,** *Green Meadow Dairy Feed,* 0.36 per cent.; **1172,** *Purina Molasses Feed,* 0.35 per cent.; and **1231,** *Presto Molasses Feed,* 0.27 per cent.; **1241,** *Schumacher's Calf Meal,* was 1.12 per cent. below guaranty in protein and 0.51 per cent. in fat. The remaining samples substantially satisfied their guaranties.

Dairy Feeds, Sampled by Purchasers.

A sample of *Sucrene Dairy Feed,* **20,** sent by H. B. Coger, Botsford, contained 18 per cent. protein. Two samples of *Biles' Union Grains,* **1083** and **1084,** sent by R. G. Waterous, Willimantic, contained 26.00 and 27.63 per cent. of protein, respectively. A sample of *Unicorn Dairy Ration,* **684,** sent by G. W. Thorpe, West Cheshire, contained 24.38 per cent. protein. A sample of *Western Stock Feed,* **756,** sent by The Coles Co., Middletown, contained 8.63 per cent. protein. Another sample, **349,** simply marked "Feed," contained 11.56 per cent. protein.

Proprietary Poultry Feeds.

(ANALYSES ON PAGE 334.)

Fourteen samples were analyzed. Two samples, **1266,** *Purity Poultry Mash,* and **1225,** *V. B. Growing Feed,* did not bear guaranties as required by law. **1199,** *Wirthmore Poultry Mash,* was 0.43 per cent. deficient in fat, but contained 7.38 per cent. more protein than guaranteed; **1288,** *Red Comb Meat Mash,* was 1.33 per cent. low in fat; and **1279,** *Park & Pollard's Dry Mash Feed,* was 1.75 per cent. low in protein. The other nine samples substantially satisfied their guaranties.

Poultry Feeds, Sampled by Purchaser.

28, *Dry Mash,* made and sent by G. W. Thorpe, West Cheshire, contained 8.04 per cent. water, 18.06 protein and 5.05 fat.

Beef Scrap, Meat Meal and Fish Meal.

(ANALYSES ON PAGE 336.)

Twelve samples were analyzed. Three samples were below their protein guaranty, **1154,** *Frisbie's Poultry Food,* by 3.12 per cent., **1345,** *Ross Poultry Meal,* by 1.37 per cent., and **1250,** *Whitman and Pratt's Beef Scrap,* by 1.31 per cent.; **1280,** Shay's *Pure Ground Beef Scrap,* was 2.83 per cent. below its fat guaranty. The samples of meat scrap show a very wide range in composition, protein ranging from 28.63 to 57 per cent., fat from 9.70 to 16.55 per cent., and ash from 17.96 to 51.06 per cent. This scrap is a variable mixture of bone and meat and cannot be expected to have a very uniform composition.

Alfalfa Feed.

Sample **1487,** Kornfalfa Feed & Milling Co., Kansas City, sent by C. M. Jarvis, New Britain, contained 7.83 per cent. water, 10.30 ash, 15.00 protein, 26.92 fiber, 37.79 nitrogen-free extract and 2.16 fat.

Bean Vine Meal.

Sample **1651,** sent by C. E. Kempton, Pomfret Centre, contained 6.56 per cent. protein, which indicates a composition similar to that reported for a sample in last year's report. The price of such a feed is the controlling factor in the economy of its use, a matter of which we have no knowledge in this particular instance.

Twigs and Molasses.

This sample, **53,** consisted of small brush, bark and twigs, to which ten gallons of molasses had been added per ton. It contained 3.69 per cent. protein and 42.59 per cent. fiber. The sample was sent by C. M. Peck, Lyme. Shredded mature wood does not contain any appreciable amount of nourishment. But bark and buds (which are immature leaves and flowers) contain the nutritive juices of the tree and the stored food from which new growth is made and therefore contain more or less food which herbivorous animals can assimilate. The chief food of deer and moose in winter is browse, i. e., buds and the twigs and branches of trees. There is no reason, therefore, why domestic stock may not eat and get some small amount of nourishment from such material, just as well as from straw, bog hay, etc., and occasional reports come to us of it being relished by cows, especially when molasses or alfalfa meal or mill feed is mixed with it. It has been proposed in the vicinity of Hamburg, where there is a mill that will grind small shrubs and branches, that land may be cleared up and the undergrowth ground and used as a substitute for hay which is very scarce and high. Maple, birch, perhaps alder, as well as huckleberry bushes might answer, but one would imagine that chestnut, sumac or oak would tan the hides of the cattle prematurely! It is said that the cost of grinding is about $5.00 per ton. As long as the material is used only by farmers in the neighborhood with full knowledge of what they are using, the matter may well be left to their experiments and experience. As a commercial "filler" or "conditioner" for dairy rations, its use would condemn the feed.

Biscuit Refuse.

1481, sent by C. M. Jarvis, New Britain, contained 14.25 per cent. water, 4.36 ash, 7.67 protein, 0.46 fiber, 66.31 nitrogen-free extract, 6.95 fat, 1.23 nitrogen, 0.20 phosphoric acid and 0.33 potash.

Fresh Harvested Ears of Corn.

Sent by John Toth, Jr., Wallingford. The kernels contained, airdry, 23.84 per cent. of water and 8.91 per cent. of protein. This corn when crib-cured with 12 per cent. of water would contain 10.29 per cent. of protein. A yield of 7,000 pounds of ears at harvest would be reckoned as 100 bushels of shelled corn according to the practice which has been generally followed in corn contests. In this sample 7,000 pounds of ears actually contained only 89 bushels of crib-cured shelled corn with 12 per cent. of moisture. Some of the record yields of late-maturing corn would be much more largely reduced, if the excessive moisture in them were left out of the account.

Summary of Deficiencies in Branding or Guaranties.

Of the 227 samples collected by our agent and analyzed, two cotton seed meals were low in protein. Seven wheat feeds were without guaranties, two low in protein and three in fat. One each of hominy feed and rye products had no guaranty. One buckwheat middlings was low in both protein and fat. One malt sprouts low in protein and two in fat. Of the proprietary horse, dairy and poultry feeds, two had no guaranties, two were deficient in protein, seven in fat and one in both protein and fat. Of the beef scraps three were deficient in protein and one in fat. Deficiences of less than 1 per cent, of protein and 0.25 per cent. of fat are not noted.

Digestibility of Feeding Stuffs by Ruminants.

Table I shows the digestion coefficients, or percentages of the food elements which are digestible by neat cattle (Lindsey's Compilation, 17th Report Mass. (Hatch) Agrl. Station, 1911, page 29 *et seq.*).

Some of these figures are the results of only a very few tests, and all of them represent short periods of feeding and must be regarded as showing comparative digestibility of the feeds only very roughly. Like chemical composition, statement of the digestibility of a feed is only a single "pointer" to the feeder, helpful, if it is not over-valued.

TABLE I.

DIGESTION COEFFICIENTS.

	Protein.	Fiber.	Nitrogen-free Extract.	Fat.
Cotton Seed Meal	84	35	78	94
Linseed Meal, new process	84	74	80	89
Linseed Meal, old process	89	57	78	89
Corn Meal	67	..	92	90
Hominy Meal	65	67	89	92
Gluten Feed	85	87	90	81
Wheat Bran	77	39	71	63
Wheat Middlings	77	30	78	88
Wheat Feed	78	62	77	87
Rye Feed	80	..	88	90
Oats	77	31	77	89
Buckwheat Middlings	85	17	83	89
Malt Sprouts	80	34	69	100
Dried Distillers' Grains	73	95	81	95
Dried Brewers' Grains	81	49	57	89
Provender	71	48	83	87
Wheat and Corn Cob Feed	63	28	71	92
Dried Beet Pulp	64	84	91	..
Oat Hulls	62	32	33	92
Cob Meal	17	65	60	50

TABLE II.—AVERAGE COMPOSITION OF FEEDS AND SELLING PRICE.

	In 100 pounds of feed are contained pounds of						In 100 pounds of feed are contained pounds of digestible				
	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Ether Extract (fat).	Protein.	Fiber.	Nitrogen-free Extract.	Fat.	Cost per ton.
I. Protein over 30 per cent.											
Cotton Seed Meal	7.80	6.43	40.89	8.23	27.93	8.72	34.3	2.9	21.8	8.2	$33.12
Linseed Meal, new process	9.98	5.46	38.10	8.29	35.33	2.84	32.0	6.1	28.3	2.5	41.00
Linseed Meal, old process	9.77	5.28	34.60	7.74	35.88	6.73	30.8	4.4	27.9	6.0	39.00
Dried Distillers' Grains, Husted	7.36	1.38	31.25	11.15	36.71	12.15	22.8	11.6	29.7	11.5	34.00
Ajax Flakes	7.17	3.03	30.75	10.63	36.14	12.28	22.4	10.1	29.3	11.7	36.00
Buckwheat Middlings, high grade	12.81	5.02	30.38	8.89	35.30	7.60	25.8	1.5	29.3	6.8	32.00
Dried Distillers' Grains, Eagle	7.57	4.18	30.00	9.25	36.42	12.58	21.9	8.8	29.5	12.0	34.00
II. Protein 30–25 per cent.											
Dried Brewers' Grains	7.78	3.18	27.89	12.66	41.63	6.86	22.6	6.2	23.7	6.1	29.75
Gluten Feed, Buffalo	9.48	3.77	27.47	6.35	50.22	2.71	23.3	5.5	45.2	2.2	30.50
" " Cream of Corn	7.44	3.50	27.13	6.49	52.44	3.00	23.1	5.6	47.2	2.4	32.00
Unicorn Dairy Ration	7.60	5.27	26.66	8.91	45.31	6.25	....	....	....	....	33.00
Gluten Feed, Globe	7.48	4.17	26.57	6.90	52.38	2.50	22.6	6.0	47.1	2.0	33.00
Wirthmore Balanced Ration	8.41	5.46	26.56	8.18	45.58	5.81	....	....	....	....	33.00
Malt Sprouts	10.18	5.70	26.55	12.12	44.08	1.37	21.2	4.1	30.4	1.4	28.00
III. Protein 25–20 per cent.											
Blue Ribbon Dairy Feed	9.06	7.03	24.75	10.64	44.17	4.35	....	....	....	....	34.00
Gluten Feed, Hubinger's	7.80	1.72	24.75	6.34	55.18	4.21	21.0	5.5	49.7	3.4	29.00
" " Staley's	10.01	3.46	24.63	6.01	52.02	3.87	20.9	5.2	46.8	3.1	30.00
Biles' Ready Dairy Ration	8.67	5.71	24.31	9.67	45.12	6.52	....	....	....	....	33.00
Buckwheat Middlings, low grade	12.82	4.67	23.88	11.53	40.68	6.42	20.3	2.0	33.7	5.7	
Gluten Feed, Grand Rapids	8.59	0.99	22.00	7.54	57.12	3.76	18.7	6.6	51.4	3.0	30.00
V-B Dairy Feed	8.96	3.90	21.88	8.49	51.91	4.86	....	....	....	....	32.00
Husted Molasses Feed	11.69	7.05	20.25	7.41	49.55	4.05	....	....	....	....	31.00
IV. Protein 20–15 per cent.											
Larro Feed for Dairy Cows	8.08	4.44	19.38	12.46	52.21	3.43	....	....	....	....	32.00
Buf Ce Co Creamery Feed	8.80	4.44	18.75	9.50	52.92	5.59	....	...	....	....	34.00
Sucrene Dairy Feed	10.56	9.20	18.13	11.17	45.24	5.70	....	....	....	....	29.00
Red Dog Flour	10.73	2.55	17.86	2.11	61.81	4.94	....	...	....	....	35.33
Wheat Middlings	10.64	4.24	17.76	5.85	56.29	5.22	13.7	1.8	43.9	4.6	31.48

TABLE II.—AVERAGE COMPOSITION OF FEEDS AND SELLING PRICE—*Continued.*

	In 100 pounds of feed are contained pounds of						In 100 pounds of feed are contained pounds of digestible				
	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Ether Extract (fat).	Protein.	Fiber.	Nitrogen-free Extract.	Fat.	Cost per ton.
Rye Middlings	10.37	4.02	17.00	5.17	59.91	3.53	....	....	....	....	31.00
Wheat Mixed Feed	9.98	5.25	16.70	7.28	56.01	4.78	13.0	4.5	43.1	4.2	30.23
Henkel's Fine White Feed	10.45	3.71	16.50	4.45	61.19	3.70	....	....	....	....	35.00
Quaker Dairy Molasses Feed	9.50	7.37	16.50	11.12	51.31	4.20	....	....	....	....	30.00
Wheat Bran	9.92	6.26	15.82	9.50	53.67	4.83	12.2	3.7	38.1	3.0	27.85
Rye Feed	10.28	4.61	15.60	5.45	60.61	3.45	12.5	....	53.3	3.1	33.00
V. Protein 15–10 per cent.											
Presto Molasses Feed	13.18	6.47	14.38	6.75	56.09	3.13	....	....	....	....	32.00
Rye Bran	10.99	2.82	13.44	2.62	67.49	2.64	....	....	....	....	30.00
Bonnie Horse Feed	10.47	2.72	13.00	5.73	63.63	4.45	....	....	....	....	33.00
Algrane Horse Feed	8.58	3.71	12.50	10.85	59.49	4.87	....	....	....	....	34.00
V-B Horse Feed	10.15	2.41	12.00	5.23	65.06	5.15	....	....	....	....	32.00
Zenith Stock Feed	10.72	3.56	11.81	5.40	62.99	5.52	....	....	....	...	35.00
Buf Ce Co Horse Feed	9.60	3.39	11.56	9.07	62.41	3.97	....	....	....	....	35.00
Green Meadow Dairy Feed	17.70	10.86	11.30	15.00	44.50	0.64	....	....	....	....	29.00
Hominy Feed	9.83	2.53	11.29	4.03	64.67	7.65	7.3	2.7	57.6	7.0	30.33
Grandin's Stock Feed	8.71	3.44	11.25	6.20	62.31	8.09	....	....	....	....	30.00
Corn, Oats and Barley	10.10	2.26	11.04	4.98	67.65	3.97	....	....	....	....	31.00
Wirthmore Stock Feed	8.22	3.24	10.94	7.92	63.20	6.48	....	....	....	....	30.00
Wheat and Corn Cob Feed	10.17	4.29	10.82	14.71	56.76	3.25	6.8	4.1	40.3	3.0	24.50
Provender (Ground Corn and Oats)	11.24	2.08	10.72	4.90	66.72	4.34	7.6	2.4	55.4	3.8	32.50
Husted Steam-Cooked Feed	10.33	2.28	10.63	5.48	66.51	4.77	....	....	....	....	35.00
Purina Molasses Feed	12.20	5.62	10.50	9.57	59.96	2.15	....	....	....	....	39.00
Schumacher's Stock Feed	9.06	3.19	10.38	9.45	64.34	3.58	....	....	....	....	31.00
Husted Molasses Horse Feed	10.65	4.97	10.31	6.26	64.06	3.75	....	....	....	....	30.00
Schumacher's Special Horse Feed	9.05	4.40	10.25	7.67	65.04	3.59	....	....	....	....	29.00
Star Feed	8.64	2.26	10.13	8.04	63.81	7.12	....	....	....	....	30.00
VI. Protein under 10 per cent.											
Corn and Oat Feeds and Chop Feeds	9.35	3.30	9.79	8.67	64.17	4.72	7.0	4.2	53.3	4.1	30.77
Dried Beet Pulp and Molasses	8.84	4.52	9.63	16.34	59.79	0.88	....	....	....	....	28.00
Dried Beet Pulp	8.96	3.06	8.50	19.18	59.37	0.93	5.4	16.1	54.0	....	29.00

Average Composition, Digestibility and Selling Price of Commercial Feeds.

Table II contains a summary of the facts given in more detail in Table V, and shows, first, the average composition of these feeds as determined by the present inspection, arranged according to their protein content; second, the amount of digestible matter in each feed, as far as we have been able to calculate it; and third, the average retail prices in November last.

The feeds are tabulated in six groups. The following statement gives the average number of pounds of digestible protein, fiber and nitrogen-free extract, and fat purchasable for one dollar in each of these groups:

Digestible Nutrients Purchasable for One Dollar.

Group.		Protein.	Fiber and Nitrogen-free Extract.	Fat.
1	Containing over 30 per cent. protein	15.3	19.5	4.9
2	" 25 to 30 " "	14.8	28.6	1.8
3	" 20 to 25 " "	13.7	37.2	2.2
4	" 15 to 20 " "	8.4	30.8	2.5
5	" 10 to 15 " "	5.0	37.4	3.1
6	" less than 10 " "	4.2	43.0	1.7

While too sweeping deductions should not be drawn from these group averages, it is apparent that one dollar in the first three groups supplies the feeder with from two to four times as much protein as in groups 4, 5 and 6. It is protein that the feeder requires to "balance" the feeding rations of his stock. With an abundance of roughage on hand there is no apparent reason for the purchase of low-grade feeds. Generally speaking the dairyman should raise his own carbohydrate feeds and where necessary should supplement these with those high-grade feeds in which he can purchase digestible protein at the lowest cost. The fact pointed out in previous years is true this year: for $29 per ton the feeder may buy feeds containing from 8.50 to 29.75 per cent. protein, while for $32 he may buy feeds ranging from 9.81 to 40.89 per cent. protein. Failure to observe this lack of relation between cost and the needed nutriment supplied may explain why in many cases the dairy business is no longer profitable.

The Manurial Ingredients of Feeds.

The manurial value of a feed is largely determined by the amount of nitrogen it contains, although the ash constituents, phosphoric acid and potash, are also of considerable importance. The more concentrated feeds, when finely ground, are quite as good sources of available organic nitrogen as the best commercial fertilizers; the phosphoric acid and potash of feeds, however, are less valuable than the more soluble forms. The following table shows the average content of the fertilizing elements found in the dairy and stock feeds sold in this State. In many cases the analyses of standard feeds in other states, notably New Jersey, have been utilized; in thirty-three cases, however, analyses were made in the samples actually examined in the present inspection. In addition the manurial constituents of the more important home-grown feeds are also included.

It is at once noticeable that there are wide variations in the amounts of fertilizing ingredients contained in the different commercial feeds. Nitrogen ranges from 0.54 to 7.14 per cent., phosphoric acid from 0.15 to 3.09 per cent., and potash from 0.08 to 4.61 per cent. One hundred pounds of cotton seed meal, for instance, would supply 12.05 pounds of total plant-food, while the same quantity of oat hulls would furnish but 1.30 pounds. It must be remembered, however, that a certain portion of the fertilizing elements of the feed is retained in the animal itself or given off by other means than the excreta, the amount depending upon the kind of animal and the object of feeding. Lawes and Gilbert have shown at Rothamsted that in milking cows about 75 per cent. of the nitrogen and 90 per cent. of the phosphoric acid and potash are voided as excrement or perspiration, the remainder going into the milk or adding to the weight of the animal. With mature horses the same investigators showed that all of the nitrogen, phosphoric acid and potash is voided in the excrement or perspiration. As the feeds enumerated in the table are chiefly dairy feeds, they will be discussed entirely from the dairy standpoint.

Nitrogen is the most valuable and most important fertilizing element supplied by feeds, and it is in nitrogen that they show the greatest variation. In the fertilizer inspection of last year it was found that the average mixed fertilizer contained 2.95

TABLE III.—MANURIAL INGREDIENTS IN FEEDS.

Feed.	Nitrogen.	Phosphoric Acid.	Potash.
Oil Cake Meals.	%	%	%
Cotton Seed Meal	7.14	3.09	1.82
Linseed Meal, new process	5.70	2.16	1.49
" " old process	5.43	1.88	1.31
Wheat Products.			
Wheat Bran	2.56	2.92	1.57
Wheat Feed	2.72	2.04	0.54
Wheat Middlings	2.69	1.61	0.82
Red Dog Flour	2.86	1.42	0.80
Corn Products.			
Gluten Feed, Buffalo	4.39	1.64	1.02
" " Cream of Corn	4.34	1.48	0.98
" " Globe	4.25	1.27	1.05
" " Grand Rapids	3.52	0.36	0.08
" " Hubinger's	3.96	0.83	0.25
" " Staley's	3.94	1.36	0.87
Hominy Feed	1.75	1.40	0.75
Hominy Feed and Corn Cob (Star)	1.62	0.96	0.69
Corn Meal	1.44	0.63	0.37
Rye, Buckwheat, and Oat Products.			
Rye Bran	2.25	1.54	0.95
Rye Feed	2.45	1.56	1.07
Rye Middlings	2.72	1.87	1.22
Buckwheat Middlings, high grade	4.88	2.60	1.33
Ground Oats	1.78	0.76	0.50
Oat Hulls	0.54	0.24	0.52
Brewery and Distillery Products.			
Malt Sprouts	4.13	1.61	1.78
Dried Brewers' Grains	4.11	1.01	0.08
Ajax Flakes	4.92	1.18	0.59
Eagle Distillers' Grains	4.80	1.69	0.96
Husted Distillers' Grains	5.00	0.54	0.12
Miscellaneous Feeds.			
Dried Beet Pulp	1.29	0.24	0.57
Dried Beet Pulp and Molasses	1.54	0.15	1.81
Corn and Oats (Provender)	1.57	0.71	0.44
Corn and Oats Chop	1.42	0.87	0.63
Corn, Oats and Barley	1.77	0.69	0.50
Wheat and Corn Cob Feed	1.73	1.80	1.16
Dairy and Stock Feeds.			
Biles Ready Dairy Ration	3.89	1.79	1.20
Blatchford's Calf Meal	4.03	1.45	1.13
Blue Ribbon Dairy Feed	3.96	1.80	2.12
Buf Ce Co. Creamery Feed	3.00	1.73	1.07
Grandin's Stock Feed	1.80	1.15	0.73

Table III.—Manurial Ingredients in Feeds—*Continued.*

Feed.	Nitrogen.	Phosphoric Acid.	Potash.
Dairy and Stock Feeds—Continued.	%	%	%
Green Meadow Dairy Feed	1.81	0.23	4.61*
Henkel's Fine White Feed	2.64	1.52	0.94
Husted Molasses Feed	3.24	1.24	1.47
Husted Steam Cooked Feed	1.70	0.69	0.49
Larro Feed for Dairy Cows	3.10	1.22	0.88
Presto Molasses Feed	2.30	1.93	1.77
Purina Molasses Feed	1.68	0.40	1.75
Quaker Molasses Dairy Feed	2.64	0.96	1.56
Schumacher's Calf Meal	2.86	1.60	0.56
Schumacher's Stock Feed	1.66	0.67	0.64
Sucrene Dairy Feed	2.90	1.20	1.81
Unicorn Dairy Ration	4.27	1.88	1.16
Zenith Stock Feed	1.89	1.01	0.66
V-B Dairy Feed	3.50	1.28	0.91
Wirthmore Balanced Ration	4.25	1.56	1.11
Wirthmore Stock Feed	1.75	1.09	0.72
Farm Crops.			
Corn Fodder, field-cured	0.86	0.36	1.07
Corn Silage	0.24	0.12	0.33
Corn Stalks, dried	0.82	0.28	0.95
" " field-cured	0.61	0.33	0.83
Hay, Alfalfa	2.66	0.54	2.46
" Cow Pea	2.48	0.66	2.36
" Red Clover	1.97	0.40	1.75
" Timothy	0.96	0.36	1.26
Straw, Oat	0.65	0.22	1.22
" Rye	0.50	0.29	0.79
" Wheat	0.43	0.13	0.74

* This figure is correct for the sample examined but appears quite abnormal.

per cent. nitrogen. The table shows that eighteen of the fifty-two feeds tabulated contain more than the manurial equivalent of this amount, 3.93 per cent. These include cotton seed and linseed meals, gluten feed, buckwheat middlings, the brewery and distillery products and a few of the feed mixtures. It is obvious, therefore, that a wise selection of feeds enhances the value of the manure and consequently plays an important part in farm economy.

There are also wide variations in the amounts of phosphoric acid and potash supplied by the different feeds. Phosphoric acid is supplied most abundantly in the oil-cake meals, wheat, rye and buckwheat products, malt sprouts and certain brands of gluten feed; nine of the feed mixtures also contain over 1.40 per cent.

of this element. On the other hand, oat hulls, dried beet pulp, certain distillers' grains and those gluten feeds to which the "steep" liquor is not added are very poor in phosphoric acid.

Potash is found in largest quantity in the oil-cake meals, wheat bran, buckwheat middlings, malt sprouts, dried beet pulp and molasses, and certain feed mixtures in which molasses is a prominent ingredient. Certain gluten feeds and distillers' grains, and dried brewers' grains contain but very small quantities of potash.

Of the home-grown crops alfalfa, cow pea and red clover hay are all rich in nitrogen and potash, and oat straw contains considerable potash; all, however, are low in phosphoric acid.

A comparison of the feeds, pound for pound, however, in many cases is hardly fair, for certain of the more concentrated feeds, cotton seed meal, for instance, can form but a small part of the ordinary dairy ration. Two pounds of cotton seed meal would supply no more nitrogen than six pounds of wheat bran, and only one-third of the phosphoric acid and less than half the potash. On the other hand wheat bran and wheat middlings could be fed in equal amounts, and here the bran would supply nearly double the amount of phosphoric acid and potash and only a little less nitrogen than the middlings. Malt sprouts and dried brewers' grains likewise would probably be fed in equal amounts, furnishing equal quantities of nitrogen, but by the feeding of the sprouts, two-thirds more phosphoric acid and twenty-two times as much potash would be supplied to the manure. The practical feeder, therefore, has a great opportunity to improve the quality of his farm manure simply by a wise selection of the feeds he uses for his stock, and this improvement, in the majority of cases, may be effected at no increased expense. It must be emphasized, nevertheless, that while the feeder has this opportunity of improving his farm manure, especially in its nitrogen content, this same nitrogen is the most elusive of all the fertilizing elements, and all the advantage of a wise selection of feeds may be lost through carelessness in the preservation of the manure.

The Cost of Feeds.

No feeder needs to be told that the prices of all feeds have advanced in recent years, but unless he has kept accurate records perhaps he has not realized how great this advance has been. This station began its official inspection of feeds in 1899 and since then it has a record of the average prices asked for the various feeds in October and November of each year. Prior to 1899 all feed prices had been quite low but in that year an upward tendency was noted. The year 1902 showed greatly advanced prices, especially for cotton seed and linseed meals, brewery and distillery products, gluten feed and hominy feed, the latter feed showing an increase of $10.34 per ton over the price of 1899. The next year the prices of all of these feeds dropped considerably, but the prices of wheat products, bran, feed and middlings, then began an advance that has continued with slight fluctuations until the present time. The maximum prices for practically all of the feeds have been shown in the past three years. Table IV gives a summary of these average prices in thirteen of the standard feeds on which we had sufficient data to warrant their inclusion. These figures show that during the last three years the Connecticut feeder has been paying from 28 to 95 per cent. more

TABLE IV.—VARIATIONS IN SELLING PRICE, 1899–1912.

Feed.	Average Price, 1899–1912.				1912 price compared with lowest price 1899–1912.	
	Highest.	Year.	Lowest.	Year.	Increase.	Per cent. Increase.
Cotton Seed Meal	$34.85	'09	$24.20	'99	$10.65	44
Linseed Meal, new process	39.00	'12	25.75	'03	13.25	51
Linseed Meal, old process	42.75	'11	26.25	'03	16.50	63
Dried Distillers' Grains, high grade	34.67	'12	27.00	'06	7.67	28
Dried Brewers' Grains	29.75	'12	*26.75	'06	*3.00	*11
Malt Sprouts	28.00	'12	16.75	'01	11.25	67
Gluten Feed	32.71	'08	20.17	'99	12.54	62
Buckwheat Middlings, high grade	32.00	'12	18.00	'00	14.00	78
Wheat Bran	30.97	'07	19.53	'99	11.44	59
Wheat Feed	31.74	'07	19.55	'99	12.19	62
Wheat Middlings	32.80	'11	19.76	'99	13.04	66
Hominy Feed	32.86	'11	17.79	'99	15.07	85
Provender (Corn and Oats)	37.00	'11	19.00	'00	18.00	95

* Not examined in this State before 1906; in New Jersey this feed sold for $18.03 in 1899 and $19.06 in 1900, the Connecticut 1912 price showing an increase of $11.72, or 65 per cent.

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	OIL SEED PRODUCTS. *Cotton Seed Meal.*	
1184	Owl Brand. F. W. Brode & Co., Memphis, Tenn.	*Wallingford:* E. E. Hall
1220	Buckeye. Buckeye Cotton Oil Co., Cincinnati, O.	*Plainville:* Eaton Bros
1271	" " " " "	*Middletown:* Meech & Stoddard.
1291	" " " " "	*Suffield:* Spencer Bros
1314	Acme Brand. T. H. Bunch, Little Rock, Ark.	*Willimantic:* H. A. Bugbee
1357	Old Gold Brand. " " " " "	*Winsted:* E. Manchester & Sons
1224	Choice. Chickasha Cotton Oil Co., Chickasha, Okla.	*Milford:* E. L. Oviatt
1201	Dixie Brand. Humphreys, Godwin & Co., Memphis, Tenn.	*Meriden:* Grain & Feed Co.
1202	Forfat Brand. Humphreys, Godwin & Co., Memphis, Tenn.	*Meriden:* A. Grulich
1302	Imperial. Imperial Cotto Mill Co., Memphis, Tenn.	*Rockville:* E. White
1249	Peacock Brand. Keeton McArthur Co., Atlanta, Ga.	*Bethel:* Johnston & Morrison
1237	Choice. Kemper Mill & Elev. Co., Kansas City, Mo.	*South Norwalk:* S. Roodner
1267	Dirigo Brand. W. Newton Smith, Baltimore, Md.	*Middlefield:* A. E. Miller
1166	Pioneer Brand. J. E. Soper Co., Boston	*Derby:* Peterson-Hendee Co.
1312	" " " " "	*Willimantic:* E. A. Buck & Co.
1324	——— ——— " " "	*New Haven:* W. E. Crittenden
1262	Bonita Brand. Southern Cotton Oil Co., Charlotte, N. C.	*Waterbury:* H. S. Coe & Co.
		Average guaranty
		Average of these 17 analyses
		Average digestible
	Linseed Meal, New Process.	
1198	American Linseed Co., Chicago	*Meriden:* Grain & Feed Co.
1308	" " "	*Stafford Springs:* G. L. Dennis
		Average guaranty
		Average of these 2 analyses
		Average digestible
	Linseed Meal, Old Process.	
1350	American Linseed Co., New York	*Colchester:* David Shea
1186	The Guy G. Major Co., Toledo, O.	*Hamden:* I. W. Beers
1329	Red Wing Linseed Co., Red Wing, Minn.	*New London:* P. Schwartz Co.
		Average guaranty
		Average of these 3 analyses
		Average digestible
	WHEAT PRODUCTS. *Wheat Bran.*	
1323	Atlas. Atlas Flour Mills, Milwaukee, Wis.	*New Haven:* W. E. Crittenden
1160	Winona. Bay State Mill Co., Winona, Minn.	*Ansonia:* Flour & Grain Co.
1204	Niagara. Cataract City Mill Co., Niagara Falls, N. Y.	*Meriden:* A. Grulich
1193	Commander. Commander Mill Co., Minneapolis, Minn.	*Plantsville:* T. B. Atwater

SAMPLED IN 1912.

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1184	9.02	5.92	41.31	7.48	28.05	8.22	$32.00
1220	7.20	6.17	38.44	10.79	29 22	8.18	34.00
1271	7.35	6.30	39.00	10.96	28.27	8.12	33.00
1291	8.80	6.56	40.63	8.10	27.03	8.88	36.00
1314	7.27	6.63	39.50	8.57	29.29	8.74	33.00
1357	7.15	6.58	44.25	4.55	26.08	11.39	33.00
1224	7.60	5.51	45.38	8.24	25.86	7.41	34.00
1201	8.70	6.22	37.75	8.62	28.28	10.43	34.00
1202	7.05	6.23	39.38	11.13	28.28	7.93	32.00
1302	7.29	6.89	41.00	7.99	27.88	8.95	32.00
1249	8.84	6.53	41.13	7.29	27.94	8.27	34.00
1237	7.19	6.79	38.25	9.83	29.77	8.17	34.00
1267	8.42	6.22	37.63	10.69	28.72	8.32	32.00
1166	9.41	6.41	42.25	4.84	26.83	10.26	33.00
1312	5.31	7.07	47.25	5.91	26.89	7.57	32.00
1324	7.69	6.69	42.00	7.50	27.66	8.46	34.00
1262	8.27	6.53	39.94	7.43	28.92	8.91	31.00
....	....	....	39.83	....	.....	7.09	.....
....	7.80	6.43	40.89	8.23	27.93	8.72	33.12
....	....	....	34.3	2.9	21.8	8.2	.....
1198	9.88	5.48	38.69	8.20	34.95	2.80	40.00
1308	10.08	5.44	37.50	8.39	35.72	2.87	42.00
....	....	....	36.00	....	.....	1.00	.....
....	9.98	5.46	38.10	8.29	35.33	2.84	41.00
....	....	....	32.0	6.1	28.3	2.5	.....
1350	10.37	5.12	34.81	8.29	35.88	5.53	42.00
1186	10.32	4.64	33.00	7.89	37.20	6.95	39.00
1329	8.62	6.08	36.00	7.05	34.54	7.71	36.00
....	....	....	31.33	....	.....	5.33	.....
....	9.77	5.28	34.60	7.74	35.88	6.73	39.00
....	....	....	30.8	4.4	27.9	6.0	.....
1323	10.27	6.69	17.00	9.95	50.88	5.21	26.00
1160	9.82	6.19	16.25	10.02	52.79	4.93	28.00
1204	10.05	6.01	15.75	9.70	53.35	5.14	30.00
1193	9.15	6.64	15.88	10.33	52.68	5.32	30.00

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	WHEAT PRODUCTS.—*Continued.*	
	Wheat Bran.	
1217	Monogram. C. M. Cox Co., Boston	*Plainville:* F. B. Newton
1256	Eagle Roller Mill Co., New Ulm, Minn.	*Danbury:* F. C. Benjamin & Co.
1258	Winter. Wm. Hamilton & Son, Honedye Falls, N. Y.	*Waterbury:* I. A. Spencer Grain Co.
1149	Choice. Hecker-Jones-Jewell Mill Co., New York	*Branford:* S. V. Osborn
1183	Ben Hur. Hennepin Mills Co., Minneapolis, Minn.	*Wallingford:* E. E. Hall
1145	Dreadnought. Hunter-Robinson-Wenz Mill Co., St. Louis, Mo.	*East Haven:* F. A. Forbes
1362	Spring. Jennison Bros. & Co., Janesville, Minn.	*Torrington:* D. L. Talcott
1358	Bran & Wheat Screenings. The K. B. R. Mill Co., Marquette, Kan.	*Winsted:* E. Manchester & Sons
1283	Maney Mill Co., Omaha, Neb.	*Hartford:* Smith, Northam & Co.
1175	W. T. Naldrett, Norvell, Mich.	*No. Haven:* Coöperative Feed Co.
1297	Seal of Minn. New Prague Mill Co., New Prague, Minn.	*Manchester:* Little & McKinney.
1161	Choice. Niagara Falls Mill Co., Niagara Falls, N. Y.	*Ansonia:* Flour & Grain Co.
1156	Northwestern Cons. Mill Co., Minneapolis, Minn.	*Guilford:* Morse & Landon
1150	Pillsbury's Minneapolis, Minn.	*Branford:* S. V. Osborn
1274	Sleepy Eye. Sleepy Eye Flour Mill Co., Sleepy Eye, Minn.	*Middletown:* Meech & Stoddard.
1207	Red Turkey. Southwestern Mill Co., Kansas City, Mo.	*New Britain:* C. W. Lines Co.
1268	Fancy. Geo. Tileston Mill Co., St. Cloud, Minn.	*Middlefield:* A. E. Miller
1318	Voigt Milling Co., Detroit, Mich.	*New Haven:* R. G. Davis & Sons
1213	Coarse. Washburn-Crosby Co., Minneapolis, Minn.	*Southington:* Lumber & Feed Co.
1295	Western Canada Flour Mills, Canada	*Suffield:* A. Sikes
1221	No tags. *Bought from Terry Co., Bridgeport	*Plainville:* Eaton Bros.
1284	No tags	*Hartford:* Smith, Northam & Co.
		Average of these 26 analyses
		Average digestible
	Wheat Middlings.	
1292	Atlas Extra Flour. Atlas Flour Mill Co., Milwaukee, Wis.	*Suffield:* Spencer Bros.
1328	Fancy Low Grade. Barber Mill Co., Minneapolis, Minn.	*New London:* P. Schwartz Co.
1159	Winona. Bay State Mill Co., Winona, Minn.	*Ansonia:* Flour & Grain Co.
1212	Puritan Flour. Brooks Elev. Co., Minneapolis, Minn.	*New Britain:* Stanley Svea Co.
1203	Standard. Cataract City Mill Co., Niagara Falls, N. Y.	*Meriden:* A. Grulich
1176	Chas. M. Cox Co., Boston, Mass.	*No. Haven:* Coöperative Feed Co.
1341	Crescent Milling Co., Fairfax, Minn.	*Moosup:* T. E. Main & Sons Co.
1251	Duluth Superior Mill Co., Duluth, Minn.	*Bethel:* Johnston & Morrison
1343	Lucky Spring Flour. Federal Mill Co., Lockport, N. Y.	*Danielson:* Quinebaug Grist Mill

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* Statement of dealer.

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1217	10.29	5.73	14.63	9.75	54.49	5.11	$28.00
1256	9.46	6.94	15.31	10.55	52.70	5.04	25.00
1258	10.96	5.92	14.88	9.15	54.87	4.22	30.00
1149	9.61	5.99	15.25	9.34	55.11	4.70	30.00
1183	9.80	7.00	15.13	11.23	51.97	4.87	26.00
1145	9.54	5.91	14.88	8.28	57.44	3.95	27.00
1362	10.00	6.79	16.75	9.85	51.15	5.46	27.00
1358	9.75	5.95	17.88	8.43	53.65	4.34	26.00
1283	9.88	6.55	16.50	9.07	52.66	4.74	28.00
1175	8.34	5.98	15.88	7.86	57.40	4.54	29.00
1297	9.60	6.05	16.50	10.09	52.67	5.09	28.00
1161	9.39	6.44	15.75	8.58	54.94	4.90	28.00
1156	9.76	6.47	16.13	9.54	52.90	5.20	28.00
1150	10.92	6.64	16.00	9.94	51.41	5.09	30.00
1274	11.18	6.81	15.25	10.46	51.38	4.92	26.00
1207	8.96	6.68	17.50	8.75	53.66	4.45	28.00
1268	10.58	6.06	14.63	10.21	53.65	4.87	26.00
1318	9.64	5.88	15.00	8.13	56.97	4.38	25.00
1213	10.07	6.18	15.88	10.48	51.77	5.62	30.00
1295	10.40	5.42	16.50	8.89	54.31	4.48	29.00
1221	10.48	5.60	14.38	8.00	57.26	4.28	28.00
1284	10.09	6.26	15.88	9.79	53.35	4.63	28.00
....	**9.92**	**6.26**	**15.82**	**9.50**	**53.67**	**4.83**	**27.85**
....	....	....	**12.2**	**3.7**	**38.1**	**3.0**	....
1292	10.83	4.11	17.94	6.48	55.72	4.92	34.00
1328	11.45	2.66	18.13	1.57	61.24	4.95	35.00
1159	11.08	5.25	17.63	7.40	53.29	5.35	30.00
1212	10.22	4.58	17.75	7.28	55.47	4.70	36.00
1203	9.46	5.16	17.25	7.89	54.86	5.38	33.00
1176	11.87	2.42	15.25	2.37	64.68	3.41	33.00
1341	10.12	5.06	18.38	7.22	53.10	6.12	27.00
1251	11.01	2.79	18.00	2.60	60.83	4.77	36.00
1343	10.28	4.29	19.13	6.28	54.44	5.58	30.00

Table V.—Analyses of Commercial Feeds

Station No.	Brand.	Retail Dealer.
	Wheat Products.—*Continued.*	
	Wheat Middlings.	
1230	The Gwinn Mill Co., Columbus, O.	*Bridgeport:* Vincent Bros.
1233	"H." Hecker-Jones-Jewell Mill Co., New York	*So. Norwalk:* M. T. Hatch
1147	Ben Hur Standard. Hennepin Mills Co., Minneapolis, Minn.	*East Haven:* F. A. Forbes
1270	Flour. W. J. Jennison, Minneapolis, Minn.	*Middletown:* Meech & Stoddard Co.
1304	Carnation Gray. Kemper Mill & Elev. Co., Kansas City, Mo.	*Rockville:* E. White
1247	Lidgerwood Mill Co., Lidgerwood, No. Dak.	*Springdale:* Monroe & Palmer
1305	Powerful Straight. New England Flour Co., Boston	*Rockville:* E. White
1181	Niagara Falls Mill. Co., Niagara Falls, N. Y.	*Wallingford:* Gallagher Bros.
1285	Pillsbury's "A," Minneapolis, Minn.	*Thompsonville:* H. K. Brainard
1148	" "B," " "	*Branford:* S. V. Osborn
1278	" XX Daisy " "	*East Hartford:* W. K. Ackley
1194	Bixota. Red Wing Mill. Co., Red Wing, Minn.	*Plantsville:* T. B. Atwater
1294	Flour. Russell Miller Milling Co.	*Suffield:* A. Sikes
1215	Pennant. David Stott, Detroit, Mich.	*Plainville:* F. B. Newton
1223	Tennant & Hoyt Co., Lake City, Minn.	*Milford:* E. L. Oviatt
1253	Angelus. Thompson Milling Co., Lockport, N. Y.	*Danbury:* C. W. Keeler
1269	Fancy. Geo. Tileston Mill. Co., St. Cloud, Minn.	*Middlefield:* A. E. Miller
1339	Geo. Urban Mill. Co., Buffalo, N. Y.	*Norwich:* Chas. Slosberg
1301	Vimco. Valley City Mill. Co., Grand Rapids, Mich.	*Rockville:* E. White
1319	Voigt Milling Co., Grand Rapids, Mich.	*New Haven:* R. G. Davis & Sons
1155	Standard. Washburn-Crosby Co., Minneapolis, Minn.	*Guilford:* Morse & Landon
1165	Standard. No tags	*Shelton:* Ansonia Flour & Grain Co.
		Average of these 31 analyses
		Average digestible
	Mixed Feed.	
1335	Fancy Winter. E. W. Bailey, Montpelier, Vt.	*Yantic:* A. R. Manning
1265	Bay State Mill. Co., Winona, Minn.	*Bristol:* Eaton Bros.
1167	Bull's Eye. Blish Milling Co., Seymour Ind.	*Derby:* Peterson-Hendee Co.
1188	Regent. Chas. M. Cox Co., Boston	*Hamden:* I. W. Beers
1248	Boston. Duluth Superior Mill. Co., Duluth, Minn.	*Bethel:* Johnston & Morrison
1313	Manhattan. Hecker-Jones-Jewell Mill. Co., New York	*Willimantic:* H. A. Bugbee
1368	Sunshine. Hunter-Robinson-Wenz Mill. Co., St. Louis, Mo.	*Thomaston:* L. E. Blackmer
1182	Crescent. Kemper Mill. & Elev. Co., Kansas City, Mo.	*Wallingford:* E. E. Hall
1310	Snowflake. Lawrenceburg Roller Mills Co., Lawrenceburg, Ind.	*Willimantic:* E. A. Buck & Co.
1228	Thoroughbred. Lexington Roller Mills Co., Lexington, Ky.	*Bridgeport:* Vincent Bros.
1174	W. T. Naldrett, Norvell, Mich.	*No. Haven:* Coöperative Feed Co.
1363	Donahue-Stratton Co., Milwaukee, Wis.	*Torrington:* D. L. Talcott
1336	Pennant. National Milling Co., Toledo, O.	*Yantic:* A. R. Manning

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1230	9.43	3.96	18.25	5.38	57.19	5.79	$35.00
1233	10.07	4.93	18.25	7.83	53.78	5.14	30.00
1147	10.63	5.19	17.50	8.05	53.79	4.84	28.00
1270	11.26	3.70	17.63	4.22	58.23	4.96	31.00
1304	9.03	4.59	19.88	5.09	56.35	5.06	29.00
1247	9.86	4.18	18.50	6.03	55.76	5.67	34.00
1305	9.47	5.09	20.38	5.90	53.90	5.26	28.00
1181	9.82	4.63	18.13	7.47	53.84	6.11	30.00
1285	11.19	4.28	18.00	5.67	56.08	4.78	32.00
1148	10.32	5.13	14.75	11.26	52.17	6.37	30.00
1278	12.29	3.29	18.75	3.07	57.72	4.88	36.00
1194	10.15	4.86	19.50	6.51	52.97	6.01	32.00
1294	12.03	3.06	18.00	3.07	58.84	5.00	34.00
1215	10.60	4.36	16.94	5.83	57.32	4.95	30.00
1223	10.46	4.74	18.56	6.55	53.11	6.58	32.00
1253	11.74	4.17	17.75	5.97	54.61	5.76	32.00
1269	10.77	3.98	17.31	5.23	57.33	5.38	29.00
1339	10.66	3.58	16.63	4.55	60.33	4.25	27.00
1301	10.76	4.29	16.38	5.59	58.47	4.51	30.00
1319	11.71	3.49	15.94	4.37	59.91	4.58	32.00
1155	10.01	5.50	17.63	7.66	53.90	5.30	30.00
1165	11.37	4.20	16.50	6.99	55.40	5.54	31.00
....	**10.64**	**4.24**	**17.76**	**5.85**	**56.29**	**5.22**	**31.48**
....	....	....	**13.7**	**1.8**	**43.9**	**4.6**	.....
1335	9.65	5.77	17.00	7.81	54.95	4.82	28.00
1265	10.61	4.79	17.19	6.46	55.88	5.07	32.00
1167	10.51	5.22	15.81	7.22	56.76	4.48	30.00
1188	10 42	5.17	17.63	7.83	53.71	5.24	30.00
1248	10.28	5.10	16.75	7.94	54.43	5.50	32.00
1313	9.35	5.05	17.00	7.52	56.21	4.87	28.00
1368	9.79	6.10	18.13	7.81	53.30	4.87	31.00
1182	9.29	5.06	16.63	7.02	57.76	4.24	28.00
1310	8.80	5.38	16.00	7.15	58.19	4.48	30.00
1228	9.52	4.87	15.50	6.52	59.27	4.32	31.00
1174	10.04	4.40	15.38	5.50	60.70	3.98	31.00
1363	10.78	6.71	16.25	8.24	52.66	5.36	29.00
1336	9.42	5.06	17.63	6.20	57.24	4.45	30.00

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	WHEAT PRODUCTS.—*Continued.*	
	Mixed Feed.	
1157	Niagara Falls Mill. Co., Niagara Falls, N. Y.	*Guilford:* G. F. Walter
1219	Fancy. Pillsbury's, Minneapolis, Minn.	*Plainville:* Eaton Bros.
1351	Royal. Royal Milling Co., Great Falls, Mont.	*Winsted:* Theo. Wachter
1192	Occident. Russell Miller Mill. Co.	*Cheshire:* G. W. Thorpe
1162	Gold Mine. Sheffield King Mill. Co., Minneapolis, Minn.	*Ansonia:* Flour & Grain Co.
1187	Try Me. Sparks Milling Co., Alton, Ill.	*Hamden:* I. W. Beers
1359	Wabash. " " " Terre Haute, Ind.	*Winsted:* E. Manchester & Sons
1216	Honest. David Stott, Detroit, Mich.	*Plainville:* F. B. Newton
1252	Angelus. Thompson Mill. Co., Lockport, N. Y.	*Danbury:* C. W. Keeler
1300	Farmers' Favorite Cow Feed. Valley City Mill Co., Grand Rapids, Mich.	*Rockville:* E. White
1255	Waggoner Gates Mill. Co., Independence, Mo.	*Danbury:* F. C. Benjamin & Co.
		Average of these 24 analyses
		Average digestible
	Red Dog Flour.	
1260	Niagara Falls Mill. Co., Niagara Falls, N. Y.	*Waterbury:* H. S. Coe & Co.
1275	XXX Comet. Northwestern Cons. Mill Co., Minneapolis, Minn.	*Middletown:* Meech & Stoddard.
1325	Adrian. Washburn Mills, Minneapolis, Minn.	*New London:* Arnold Rudd Co.
		Average of these 3 analyses
	MAIZE PRODUCTS.	
	Gluten Feed.	
1179	Buffalo. Corn Products Refining Co., New York	*No. Haven:* Coöperative Feed Co.
1263	" " " " " " "	*Waterbury:* H. S. Coe & Co.
		Average guaranty
		Average of these 2 analyses
		Average digestible
1299	*Cream of Corn. American Maize Products Co., New York	*Manchester;* G. W. Kuhney
1309	Cream of Corn. American Maize Products Co., New York	*Stafford Springs:* G. L. Dennis
		Average guaranty
		Average of these 2 analyses
		Average digestible
1168	Globe. Corn Products Refining Co., New York.	*Derby:* Peterson-Hendee Co.
1242	" " " " "	*Norwalk:* Holmes, Keeler & Kent Co.
		Average guaranty
		Average of these 2 analyses
		Average digestible
1353	Grand Rapids. Douglas & Co., Grand Rapids, Ia	*Winsted:* Platt & Coe
		Guaranty
		Digestible
1369	Hubinger. J. C. Hubinger Bros. Co., Keokuk, Ia.	*New Haven:* W. E. Crittenden
		Guaranty
		Digestible

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* Statement of dealer.

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1157	9.77	5.38	16.13	7.43	56.27	5.02	$34.00
1219	11.30	5.93	17.00	7.18	54.00	4.59	32.00
1351	9.89	4.66	17.81	7.28	55.27	5.09	31.00
1192	10.51	4.60	17.50	7.02	55.52	4.85	30.00
1162	10.39	5.05	17.13	7.79	54.77	4.87	31.00
1187	10.16	5.12	16.75	7.04	56.55	4.38	30.00
1359	8.60	5.16	16.75	7.17	57.92	4.40	29.00
1216	10.40	5.30	16.25	7.51	55.49	5.05	30.00
1252	10.48	5.45	16.69	8.71	53.37	5.30	31.00
1300	9.65	5.34	16.13	7.62	56.54	4.72	29.00
1255	9.97	5.20	15.63	6.64	57.85	4.71	28.50
....	**9.98**	**5.25**	**16.70**	**7.28**	**56.01**	**4.78**	**30.23**
....	....	....	**13.0**	**4.5**	**43.1**	**4.2**	.....
1260	10.35	1.83	17.13	0.93	65.70	4.06	36.00
1275	10.84	3.04	19.25	2.40	58.51	5.96	34.00
1325	11.00	2.77	17.19	3.01	61.24	4.79	36.00
....	**10.73**	**2.55**	**17.86**	**2.11**	**61.81**	**4.94**	**35.33**
1179	10.18	4.47	27.75	5.75	48.85	3.00	29.00
1263	8.79	3.07	27.19	6.96	51.58	2.41	32.00
....	....	....	**24.00**	....	.....	**2.00**	.....
....	**9.48**	**3.77**	**27.47**	**6.35**	**50.22**	**2.71**	**30.50**
....	....	....	**23.3**	**5.5**	**45.2**	**2.2**	.....
1299	8.64	3.80	27.88	6.41	51.15	2.12	30.00
1309	6.24	3.21	26.38	6.57	53.72	3.88	34.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	**7.44**	**3.50**	**27.13**	**6.49**	**52.44**	**3.00**	**32.00**
....	....	....	**23.1**	**5.6**	**47.2**	**2.4**	.....
1168	8.62	3.95	26.13	6.67	51.95	2.68	31.00
1242	6.35	4.39	27.00	7.13	52.81	2.32	35.00
....	....	....	**23.00**	....	.....	**2.00**	.....
....	**7.48**	**4.17**	**26.57**	**6.90**	**52.38**	**2.50**	**33.00**
....	....	....	**22.6**	**6.0**	**47.1**	**2.0**	.....
1353	8.59	0.99	22.00	7.54	57.12	3.76	30.00
....	....	....	**20.00**	....	.....	**2.50**	.....
....	....	....	**18.7**	**6.6**	**51.4**	**3.0**	.....
1369	7.80	1.72	24.75	6.34	55.18	4.21	29.00
....	....	....	**23.00**	....	.....	**2.40**	.....
....	....	....	**21.0**	**5.5**	**49.7**	**3.4**	.....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	MAIZE PRODUCTS.—*Continued.*	
	Gluten Feed.	
1264	Staley's. A. E. Staley Mfg. Co., Decatur, Ill....	*Bristol:* Eaton Bros.......... ...
1303	" " " " " ...	*Rockville:* E. White.............
		Average guaranty ....
		Average of these 2 analyses.....
		Average digestible..............
	Hominy Feed.	
1348	Homco. American Hominy Co., Indianoplis, Ind.	*Colchester:* Grain & Coal Co....
		Guaranty ....
1243	Buf Ce Co. Buffalo Cereal Co., Buffalo, N. Y.	*Stamford:* W. L. Crabb ....
		Guaranty.......................
1178	Wirthmore. Chas. M. Cox Co., Boston.........	*No. Haven:* Coöperative Feed Co.
		Guaranty.......................
1244	Evans. Evans Mill. Co., Indianapolis, Ind......	*Greenwich:* J. P. Johnson......
		Guaranty ....
1293	*R. J. Hardy & Sons, Boston, Mass.	*Suffield:* Spencer Bros..........
		Guaranty ....
1246	Badger. Chas. A. Krause, Milwaukee, Wis.....	*Springdale:* Monroe & Palmer ..
		Guaranty ....
1173	Steam-cooked. Miner-Hillard Mill. Co., Wilkes-barre, Pa.................................	*New Haven:* J. T. Benham Est..
		Guaranty ....
1334	Mystic Milling Co., Sioux City, Ia.	*Yantic:* A. R. Manning.........
		Guaranty ....
1189	Patent Cereals Co., Geneva, N. Y.	*Hamden:* I. W. Beers ....
		Guaranty ....
1222	Yellow. Quaker Oats Co., Chicago............	*Milford:* E. L. Oviatt ....
1257	" " " "	*Danbury:* F. C. Benjamin & Co.
		Average guaranty ....
		Average of these 2 analyses .....
1306	*Simpson, Hendee & Co., New York............	*Rockville:* E. White............
1337	Blue Ribbon. J. E. Soper Co., Boston..........	*Norwich:* Chas. Slosberg.......
		Guaranty ....
1298	Sparr Cereal Co., Marshfield, Wis...............	*Manchester:* Little & McKinney.
		Guaranty ....
1340	Logan. Standard Cereal Co., Chillicothe, O....	*Norwich:* Norwich Grain Co....
		Guaranty ....
		Average guaranty of all hominy feeds ....
		Average of these 15 analyses ....
		Average digestible..............
	Hominy Feed and Corn Cob.	
1352	Star Feed. Toledo Elevator Co., Toledo, O......	*Winsted:* Platt & Coe..........
		Guaranty ....
	RYE PRODUCTS.	
1151	Bran. Morse & Landon, Guilford	*Guilford:* Morse & Landon.....
1197	Feed. Boutwell Mill. & Grain Co., Troy, N. Y..	*Meriden:* Grain & Feed Co......
1259	Middlings. Washburn-Crosby Co., Minneapolis, Minn..................................	*Waterbury:* H. S. Coe & Co....
1367	Feed. Blodgett Mill. Co., Janesville. Wis.......	*Thomaston:* L. E. Blackmer ....

* Statement of dealer.

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1264	9.19	2.99	23.00	6.47	54.96	3.39	$32.00
1303	10.84	3.93	26.25	5.56	49.07	4.35	28.00
....	....	....	**23.00**	....	.....	**2.50**	.....
....	**10.01**	**3.46**	**24.63**	**6.01**	**52.02**	**3.87**	**30.00**
....	....	....	**20.9**	**5.2**	**46.8**	**3.1**	.....
1348	9.82	2.82	11.50	4.24	62.73	8.89	29.00
....	....	....	**9.50**	....	.....	**7.00**	.....
1243	9.45	2.69	11.38	4.17	63.47	8.84	33.00
....	....	....	**10.00**	....	.....	**7.00**	.....
1178	9.27	2.72	11.31	4.72	63.14	8.84	30.00
....	....	....	**10.00**	....	.....	**7.50**	.....
1244	10.04	2.51	11.38	4.41	63.43	8.23	34.00
....	....	....	**10.00**	....	.....	**7.50**	.....
1293	10.49	2.28	10.88	4.67	64.43	7.25	30.00
....	....	....	**10.00**	....	.....	**7.00**	.....
1246	10.40	3.08	11.88	4.40	63.39	6.85	34.00
....	....	....	**9.00**	....	.....	**6.00**	.....
1173	8.64	2.58	11.88	4.33	66.74	5.83	31.00
....	....	....	**10.00**	....	.....	**5.00**	.....
1334	8.75	2.62	11.63	4.03	64.77	8.20	29.00
....	....	....	**11.00**	....	.....	**7.00**	.....
1189	10.60	2.54	10.88	3.95	63.82	8.21	31.00
....	....	....	**10.00**	....	.....	**7.00**	.....
1222	11.52	1.76	10.25	2.19	69.45	4.83	29.00
1257	11.14	2.14	10.75	3.27	66.97	5.73	28.00
....	....	....	**9.00**	....	.....	**4.00**	.....
....	**11.33**	**1.95**	**10.50**	**2.73**	**68.21**	**5.28**	**28.50**
1306	8.38	2.87	11.56	4.52	63.65	9.02	29.00
1337	10.36	2.62	11.38	4.27	63.38	7.99	28.00
....	....	....	**10.00**	....	.....	**8.00**	.....
1298	9.37	2.45	11.75	3.63	63.96	8.84	32.00
....	....	....	**10.00**	....	.....	**8.00**	.....
1340	9.26	2.30	11.00	3.65	66.64	7.15	28.00
....	....	....	**9.00**	....	.....	**7.00**	.....
....	....	....	**9.75**	....	.....	**6.57**	.....
....	**9.83**	**2.53**	**11.29**	**4.03**	**64.67**	**7.65**	**30.33**
....	....	....	**7.3**	**2.7**	**57.6**	**7.0**	.....
1352	8.64	2.26	10.13	8.04	63.81	7.12	30.00
....	....	....	**7.00**	....	.....	**5.00**	.....
1151	10.99	2.82	13.44	2.62	67.49	2.64	30.00
1197	11.19	3.54	15.31	3.85	62.89	3.22	34.00
1259	10.37	4.02	17.00	5.17	59.91	3.53	31.00
1367	9.38	5.67	15.88	7.06	58.33	3.68	32.00

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	BUCKWHEAT PRODUCTS.	
1232	Middlings. Miner-Hillard Mill. Co., Wilkesbarre, Pa.	*So. Norwalk:* M. T. Hatch
		Digestible
1342	Middlings. Quinebaug Grist Mill, Danielson	*Danielson:*
		Digestible
	BARLEY PRODUCTS.	
	Malt Sprouts.	
1317	P. Ballantine & Sons, Newark, N. J.	*New Haven:* R. G. Davis & Sons
		Guaranty
1144	Fancy Marvel. Flint Mill. Co., Milwaukee, Wis.	*East Haven:* F. A. Forbes
		Guaranty
1169	Geneva Malting Co., Geneva, N. Y.	*New Haven:* J. T. Benham, Est.
		Guaranty
		Average of these 3 analyses
		Average digestible
	Dried Brewers' Grains.	
1290	XXX. Chicago Grain & Feed Co., Chicago	*Suffield:* Spencer Bros.
		Guaranty
1238	Bull Brand. Farmers' Feed Co., New York	*Norwalk:* Holmes, Keeler & Kent Co.
		Guaranty
1143	Providence Brewing Co., Providence, R. I.	*East Haven:* F. A. Forbes
		Guaranty
1344	C. W. Wagar & Co., Philadelphia	*Danielson:* Young Bros. Co.
		Guaranty
		Average of these 4 analyses
		Average digestible
	Dried Distillers' Grains.	
1289	Ajax Flakes. Ajax Mill. & Feed Co., Buffalo, N. Y.	*Hazardville:* A. D. Bridges & Sons Co.
		Guaranty
1355	Eagle Grains, 3 D. The Dewey Bros. Co., Blanchester, O.	*Winsted:* E. Manchester & Sons
		Guaranty
1354	Husted. Husted Milling Co., Buffalo, N. Y.	*Winsted:* E. Manchester & Sons
		Guaranty
		Average of these 3 analyses
		Average digestible
	MISCELLANEOUS FEEDS.	
	Dried Beet Pulp.	
1239	Continental Sugar Co., Findlay, O.	*Norwalk:* Holmes, Keeler & Kent Co.
1360	Menominee River Sugar Co., Menominee, Mich.	*Torrington:* D. L. Talcott
1356	Mt. Clemens Sugar Co., Mt. Clemens, Mich.	*Winsted:* E. Manchester & Sons
1364	Owosso Sugar Co., Lansing, Mich.	*Torrington:* F. U. Wadhams
1282	Charles Pope, Chicago	*Hartford:* Smith, Northam & Co.
		Guaranty of all samples
		Average of these 5 analyses
		Average digestible

SAMPLED IN 1912—*Continued.*

Station No.	POUNDS PER HUNDRED.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1232	12.82	4.67	23.88	11.53	40.68	6.42	.....
....	....	....	**20.3**	**2.0**	**33.7**	**5.7**	
1342	12.81	5.02	30.38	8.89	35.30	7.60	$32.00
....	....	....	**25.8**	**1.5**	**29.3**	**6.8**	.....
1317	7.48	6.04	24.50	15.00	45.61	1.37	27.00
....	....	....	**25.63**	.....	.....	**1.47**	.....
1144	12.22	5.75	28.25	10.38	42.13	1.27	28.00
....	....	....	**22.00**	.....	.....	**2.00**	.....
1169	10.84	5.32	26.88	10.98	44.51	1.47	29.00
....	....	....	**26.50**	.....	.....	**2.45**	.....
....	**10.18**	**5.70**	**26.55**	**12.12**	**44.08**	**1.37**	**28.00**
....	....	....	**21.2**	**4.1**	**30.4**	**1.4**	.....
1290	8.27	3.04	29.19	12.32	40.19	6.99	30.00
....	....	....	**25.00**	.....	.....	**5.00**	.....
1238	7.54	2.92	29.25	12.07	40.24	7.98	33.00
....	....	....	**27.00**	.....	.....	**6.30**	.....
1143	7.49	3.53	23.38	13.12	45.89	6.59	28.00
....	....	....	**22.00**	.....	.....	**5.00**	.....
1344	7.80	3.21	29.75	13.12	40.23	5.89	28.00
....	....	....	**24.00**	.....	.....	**6.00**	.....
....	**7.78**	**3.18**	**27.89**	**12.66**	**41.63**	**6.86**	**29.75**
....	....	....	**22.6**	**6.2**	**23.7**	**6.1**	.....
1289	7.17	3.03	30.75	10.63	36.14	12.28	36.00
....	....	....	**30.00**	.....	.....	**11.00**	.....
1355	7.57	4.18	30.00	9.25	36.42	12.58	34.00
....	....	....	**30.00**	.....	.....	**10.00**	.....
1354	7.36	1.38	31.25	11.15	36.71	12.15	34.00
....	....	....	**30.00**	.....	.....	**8.00**	.....
....	**7.37**	**2.86**	**30.67**	**10.34**	**36.42**	**12.34**	**34.67**
....	....	....	**22.4**	**9.8**	**29.5**	**11.7**	.....
1239	8.54	3.23	8.25	19.59	59.60	0.79	30.00
1360	7.97	2.61	8.44	18.86	61.07	1.05	29.00
1356	10.00	3.25	8.75	19.04	57.92	1.04	27.00
1364	9.83	2.85	8.63	18.31	59.39	0.99	28.00
1282	8.44	3.35	8.44	20.12	58.85	0.80	31.00
....	....	....	**8.00**	.....	.....	**0.50**	.....
....	**8.96**	**3.06**	**8.50**	**19.18**	**59.37**	**0.93**	**29.00**
....	....	....	**5.4**	**16.1**	**54.0**	....	.....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	MISCELLANEOUS FEEDS.	
	Dried Beet Pulp and Molasses.	
1206	Michigan Sugar Co., Alma, Mich.	*New Britain:* C. W. Lines Co.
		Guaranty
	MIXED FEEDS.	
	Corn and Oat Feeds, and Chop Feeds.	
1163	Buf Ce Co. Chop Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Shelton:* Ansonia Flour & Grain Co.
		Guaranty
1315	Iroquois Chop Feed. Buffalo Cereal Co., Buffalo, N. Y.	*New Haven:* R. G. Davis & Sons
		Guaranty
1170	Buf Ce Co. Stock Feed. Buffalo Cereal Co., Buffalo, N. Y.	*New Haven:* J. T. Benham Est.
		Guaranty
1347	Provender. Colchester Grain & Coal Co., Colchester	*Colchester:*
1338	Stock Feed. W. H. Haskell & Co., Toledo, O.	*Norwich:* Chas. Slosberg
		Guaranty
1196	Purity Stock Feed. Wm. S. Hills Co., Boston	*Plantsville:* C. O. Cowles
		Guaranty
1218	New England Stock Feed. H. O. Co., Buffalo, N. Y.	*Plainville:* Eaton Bros
		Guaranty
1195	Mayflower Stock Feed. Husted Mills, Buffalo, N. Y.	*Plantsville:* C. O. Cowles
		Guaranty
1276	Korn-Oato Feed. Meech & Stoddard, Middletown	*Middletown:*
		Guaranty
1152	Provender. Morse & Landon, Guilford	*Guilford:*
1365	Mystic Feed. Mystic Mill. & Feed Co., Rochester, N. Y.	*Torrington:* F. U. Wadhams
		Guaranty
1321	Boss Feed. Quaker Oats Co., Chicago	*New Haven:* W. E. Crittenden
		Guaranty
1327	White Diamond Feed. Quaker Oats Co., Chicago	*New London:* P. Schwartz Co.
		Guaranty
1296	Victor Feed. Quaker Oats Co., Chicago	*So. Manchester:* G. W. Strant
		Guaranty
1214	Winner Chop Feed. David Stott, Detroit, Mich.	*Plainville:* F. B. Newton
		Guaranty
	Corn, Oats and Barley.	
1333	C. W. Campbell Co., Westerly	*Westerly:*
1307	Edward White, Rockville	*Rockville:*
		Average of these 2 analyses
	Wheat and Corn Cob Feeds.	
1272	Sterling Feed. Indiana Mill. Co., Terre Haute, Ind.	*Middletown:* Meech & Stoddard.
		Guaranty
1320	Kennebec Feed. J. E. Soper Co., Boston	*New Haven:* W. E. Crittenden
		Guaranty
		Average of these 2 analyses
		Average digestible

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1206	8.84	4.52	9.63	16.34	59.79	0.88	$28.00
....	....	....	9.00	.....	.....	0.50	.....
1163	9.56	3.35	9.13	9.17	64.99	3.80	31.00
....	....	....	7.00	.....	.....	3.00	.....
1315	8.74	3.24	10.13	8.70	64.22	4.97	28.00
....	....	....	7.00	.....	.....	3.00	.....
1170	9.04	3.22	9.81	7.99	64.70	5.24	32.00
....	....	....	8.00	.....	.....	4.00	.....
1347	10.97	2.34	10.81	5.76	65.54	4.58	32.00
1338	8.89	2.91	10.00	6.12	66.10	5.98	32.00
....	....	....	8.00	.....	.....	4.00	.....
1196	8.19	4.02	10.69	10.02	62.06	5.02	34.00
....	....	....	8.00	.....	.....	3.00	.....
1218	8.05	3.60	10.19	10.16	63.37	4.73	33.00
....	....	....	9.00	.....	.....	4.00	.....
1195	10.41	3.51	10.81	5.47	64.28	5.52	32.00
....	....	....	7.50	.....	.....	3.50	.....
1276	10.36	2.61	7.88	9.87	65.77	3.51	30.00
....	....	....	7.00	.....	.....	3.00	.....
1152	11.52	1.82	10.63	4.04	67.90	4.09	33.00
1365	9.97	3.37	11.00	8.82	62.86	3.98	31.00
....	....	....	8.00	.....	.....	3.00	.....
1321	9.93	3.50	9.75	9.69	61.60	5.53	29.00
....	....	....	8.00	.....	.....	3.00	.....
1327	9.07	3.07	9.38	7.22	67.96	3.30	28.00
....	....	....	8.00	.....	.....	3.25	.....
1296	10.08	2.94	8.88	10.01	64.45	3.64	30.00
....	....	....	9.00	.....	.....	3.00	.....
1214	9.25	3.57	9.63	9.49	61.81	6.25	30.00
....	....	....	8.00	.....	.....	5.00	....
1333	11.19	2.18	11.13	4.53	67.08	3.89	32.00
1307	9.02	2.33	10.94	5.43	68.23	4.05	30.00
....	**10.10**	**2.26**	**11.04**	**4.98**	**67.65**	**3.97**	**31.00**
1272	10.20	4.48	10.88	14.15	57.00	3.29	25.00
....	....	....	9.60	.....	.....	2.75	.....
1320	10.15	4.09	10.75	15.28	56.52	3.21	24.00
....	....	....	9.80	.....	.....	2.75	.....
....	**10.17**	**4.29**	**10.82**	**14.71**	**56.76**	**3.25**	**24.50**
....	....	....	6.8	4.1	40.3	3.0	.....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	MIXED FEEDS.—*Continued.*	
	Proprietary Horse Feeds.	
1164	Buf Ce Co. Horse Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Shelton:* Ansonia Flour & Grain Co.
		Guaranty
1234	Bonnie Horse Feed. Manuel T. Hatch, South Norwalk	*South Norwalk:*
		Guaranty
1277	Algrane Horse Feed. H. O. Co., Buffalo, N. Y.	*E. Hartford:* W. K. Ackley
		Guaranty
1349	Molasses Horse Feed. Husted Mills Co., Buffalo, N. Y.	*Colchester:* David Shea
		Guaranty
1326	Schumacher's Special Horse Feed. Quaker Oats Co., Chicago	*New London:* P. Schwartz Co.
		Guaranty
1226	V-B. Horse Feed. Vincent Bros., Bridgeport	*Bridgeport:*
		Guaranty
	Proprietary Dairy and Stock Feeds.	
1254	Sucrene Dairy Feed. American Milling Co., Chicago	*Danbury:* F. C. Benjamin & Co.
		Guaranty
1273	Biles Ready Dairy Ration. The J. W. Biles Co., Cincinnati, O.	*Middletown:* Meech & Stoddard.
		Guaranty
1366	Buf Ce Co. Creamery Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Thomaston:* L. E. Blackmer
		Guaranty
1281	Calf Meal. Blatchford's Calf Meal Factory, Waukegan, Ill.	*E. Hartford:* G. M. White & Co.
		Guaranty
1185	Unicorn Dairy Ration. Chapin & Co., Milwaukee, Wis.	*Wallingford:* E. E. Hall
1191	Unicorn Dairy Ration. Chapin & Co., Milwaukee, Wis.	*Cheshire:* G. W. Thorpe
		Average guaranty
		Average of these 2 analyses
1153	Wirthmore Balanced Ration. C. M. Cox Co., Boston	*Guilford:* Morse & Landon
		Guaranty
1330	Wirthmore Stock Feed. C. M. Cox Co., Boston	*Mystic:* Mystic Grain Co.
		Guaranty
1322	Grandin's Stock Feed. D. H. Grandin Mill Co., Jamestown, N. Y.	*New Haven:* W. E. Crittenden
		Guaranty
1200	Henkel's Fine White Feed. Commercial Mill. Co., Detroit, Mich.	*Meriden:* Grain & Feed Co.
		Guaranty
1180	Husted Molasses Feed. Husted Mill. Co., Buffalo, N. Y.	*Wallingford:* Gallagher Bros.
		Guaranty

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1164	9.60	3.39	11.56	9.07	62.41	3.97	$35.00
....	....	....	10.00	.....	.....	4.00	.....
1234	10.47	2.72	13.00	5.73	63.63	4.45	33.00
....	....	....	14.00	.....	.....	4.00	.....
1277	8.58	3.71	12.50	10.85	59.49	4.87	34.00
....	....	....	11.00	.....	.....	4.00	.....
1349	10.65	4.97	10.31	6.26	64.06	3.75	30.00
....	....	....	7.00	.....	.....	3.00	.....
1326	9.05	4.40	10.25	7.67	65.04	3.59	29.00
....	....	....	9.25	.....	.....	3.25	.....
1226	10.15	2.41	12.00	5.23	65.06	5.15	32.00
....	....	....	9.40	.....	.....	3.40	.....
1254	10.56	9.20	18.13	11.17	45.24	5.70	29.00
....	....	....	16.50	.....	.....	3.00	.....
1273	8.67	5.71	24.31	9.67	45.12	6.52	33.00
....	....	....	24.00	.....	.....	7.00	.....
1366	8.80	4.44	18.75	9.50	52.92	5.59	34.00
....	....	....	18.00	.....	.....	4.00	.....
1281	10.62	5.10	24.75	6.23	48.58	4.72	70.00
....	....	....	25.00	.....	.....	5.00	.....
1185	8.42	6.05	26.25	7.21	45.95	6.12	33.00
1191	6.79	4.50	27.06	10.61	44.67	6.37	33.00
....	....	....	20.00	.....	.....	5.50	.....
....	7.60	5.27	26.66	8.91	45.31	6.25	33.00
1153	8.41	5.46	26.56	8.18	45.58	5.81	33.00
....	....	....	25.50	.....	.....	5.20	.....
1330	8.22	3.24	10.94	7.92	63.20	6.48	30.00
....	....	....	9.00	.....	.....	4.00	.....
1322	8.71	3.44	11.25	6.20	62.31	8.09	30.00
....	....	....	8.50	.....	.....	3.50	.....
1200	10.45	3.71	16.50	4.45	61.19	3.70	35.00
....	....	....	15.00	.....	.....	3.50	.....
1180	11.69	7.05	20.25	7.41	49.55	4.05	31.00
....	....	....	18.00	.....	.....	4.00	.....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	Brand.	Retail Dealer.
	MIXED FEEDS.—*Continued.*	
	Proprietary Dairy and Stock Feeds.	
1211	Husted Steam Cooked Feed. Husted Mill. Co., Buffalo, N. Y.	*New Britain:* Stanley Svea Co.
		Guaranty
1209	Zenith Stock Feed. Husted Mill. Co., Buffalo, N. Y.	*New Britain:* Stanley Svea Co.
		Guaranty
1316	Larro Feed for Dairy Cows. Larrowe Mill. Co., Detroit, Mich.	*New Haven:* R. G. Davis & Son.
		Guaranty
1332	Green Meadow Dairy Feed. Omaha Alfalfa Mill. Co., Omaha, Neb.	*Westerly:* C. W. Campbell Co.
		Guaranty
1286	Blue Ribbon Dairy Feed. Quaker Oats Co., Chicago	*Thompsonville:* H. K. Brainard
		Guaranty
1190	Quaker Molasses Dairy Feed. Quaker Oats Co., Chicago	*Cheshire:* G. W. Thorpe
		Guaranty
1241	Schumacher's Calf Meal. Quaker Oats Co., Chicago	*Norwalk:* Holmes, Keeler & Kent Co.
		Guaranty
1177	Schumacher's Stock Feed. Quaker Oats Co., Chicago	*No. Haven:* Coöperative Feed Co.
		Guaranty
1172	Purina Molasses Feed. Ralston Purina Co., St. Louis	*New Haven:* J. T. Benham, Est.
		Guaranty
1231	Presto Molasses Feed. Scientific Feed Co., Milford	*Bridgeport:* Vincent Bros.
		Guaranty
1227	V-B. Dairy Feed. Vincent Bros., Bridgeport	*Bridgeport:*
		Guaranty
	Proprietary Poultry Feeds.	
1205	American Poultry Feed. Quaker Oats Co., Chicago	*Meriden:* A. Grulich
		Guaranty
1361	Buf Ce Co. Poultry Feed. Buffalo Cereal Co., Buffalo, N. Y.	*Torrington:* D. L. Talcott
		Guaranty
1199	Wirthmore Poultry Mash. C. M. Cox Co., Boston	*Meriden:* Grain & Feed Co.
		Guaranty
1261	Queen Poultry Mash. Albert Dickinson Co., Chicago	*Waterbury:* H. S. Coe & Co.
		Guaranty
1288	Red Comb Meal Mash. Edwards & Loomis, Chicago	*Hazardville:* A. D. Bridges Sons Co.
		Guaranty
1235	Bonnie Poultry Feed. Manuel T. Hatch, So. Norwalk	*So. Norwalk:*
		Guaranty

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1211	10.33	2.28	10.63	5.48	66.51	4.77	$35.00
....	....	....	9.00	.....	.....	4.00	.....
1209	10.72	3.56	11.81	5.40	62.99	5.52	35.00
....	....	....	10.00	.....	.....	4.00	.....
1316	8.08	4.44	19.38	12.46	52.21	3.43	32.00
....	....	....	19.00	.....	.....	3.00	.....
1332	17.70	10.86	11.30	15.00	44.50	0.64	29.00
....	....	....	11.00	.....	.....	1.00	.....
1286	9.06	7.03	24.75	10.64	44.17	4.35	34.00
....	....	....	25.00	.....	.....	4.00	.....
1190	9.50	7.37	16.50	11.12	51.31	4.20	30.00
....	....	....	16.00	.....	.....	3.50	.....
1241	9.03	4.84	17.88	2.68	58.08	7.49	64.00
....	....	....	19.00	.....	.....	8.00	.....
1177	9.06	3.19	10.38	9.45	64.34	3.58	31.00
....	....	....	10.00	.....	.....	3.25	.....
1172	12.20	5.62	10.50	9.57	59.96	2.15	39.00
....	....	....	10.00	.....	.....	2.50	.....
1231	13.18	6.47	14.38	6.75	56.09	3.13	32.00
....	....	....	14.00	.....	.....	3.40	.....
1227	8.96	3.90	21.88	8.49	51.91	4.86	32.00
....	....	....	20.00	.....	.....	4.00	.....
1205	10.67	2.62	13.63	3.88	64.08	5.12	38.00
....	....	....	12.00	.....	.....	3.50	.....
1361	9.29	2.86	17.00	5.01	60.68	5.16	42.00
....	....	....	15.00	.....	.....	4.00	.....
1199	9.40	13.35	24.38	5.21	44.09	3.57	45.00
....	....	....	17.00	.....	.....	4.00	.....
1261	10.93	3.44	10.38	5.85	65.78	3.62	42.00
....	....	....	11.00	.....	.....	2.50	.....
1288	11.08	5.28	14.75	7.53	58.69	2.67	45.00
....	....	....	15.00	.....	.....	4.00	.....
1235	9.90	8.04	17.13	6.63	54.30	4.00	43.00
....	....	....	16.00	.....	.....	4.00	.....

TABLE V.—ANALYSES OF COMMERCIAL FEEDS

Station No.	BRAND.	RETAIL DEALER.
	MIXED FEEDS.—*Concluded.*	
	Proprietary Poultry Feeds.	
1266	*Purity Poultry Mash. Wm. Hills & Co., Boston	*Bristol:* W. O. Goodsell
1208	H. O. Poultry Feed. H. O. Co., Buffalo, N. Y.	*New Britain:* C. W. Lines Co.
		Guaranty
1210	Husted Laying Mash. Husted Mills, Buffalo, N. Y.	*New Britain:* Stanley Svea Co.
		Guaranty
1279	Dry Mash Feed. Park & Pollard Co., Boston	*E. Hartford:* G. M. White & Co.
		Guaranty
1240	Growing Feed. Park & Pollard Co., Boston	*Norwalk:* Holmes, Keeler & Kent Co.
		Guaranty
1171	Chicken Chowder Feed. Purina Mills, St. Louis.	*New Haven:* J. T. Benham, Est.
		Guaranty
1225	V-B Growing Feed. Vincent Bros., Bridgeport.	*Bridgeport:*
1245	V-B Mash for Laying Hens. Vincent Bros., Bridgeport	*Greenwich:* J. P. Johnson
		Guaranty
	Beef Scrap, Meat Meal and Fish Meal.	
1229	Ground Beef Scrap. Joseph Breck & Sons, Boston	*Bridgeport:* Vincent Bros.
		Guaranty
1158	Meat Meal for Poultry. Conn. Fat Rend. Co., New Haven	*Guilford:* G. F. Walter
		Guaranty
1154	Frisbie's Poultry Food. L. T. Frisbie Co., New Haven	*Guilford:* Morse & Landon
		Guaranty
1346	Fish Meal. Wm. S. Hills Co., Boston	*Danielson.* Young Bros. Co.
		Guaranty
1331	Pawtucket Poultry Food. Pawtucket Rend. Co., Pawtucket, R. I.	*Westerly:* C. W. Campbell Co.
		Guaranty
1345	Poultry Meal. Ross Bros. Co., Worcester, Mass.	*Danielson:* Young Bros. Co.
		Guaranty
1280	Pure Ground Beef Scrap. C. M. Shay Fert. Co., Groton	*E. Hartford:* G. M. White & Co.
		Guaranty
1146	Ground Beef Scraps. M. L. Shoemaker Co., Philadelphia	*E. Haven:* F. A. Forbes
		Guaranty
1287	Poultry Food. Springfield Rend. Co., Springfield, Mass.	*Thompsonville:* H. K. Brainard.
		Guaranty
1236	Cooked Meat Scraps. Swift's Lowell Fert. Co., Boston	*So. Norwalk:* M. T. Hatch
		Guaranty
1250	Beef Scrap. Whitman & Pratt Rend. Co., Lowell, Mass.	*Bethel:* Johnston & Morrison
		Guaranty
1311	Poultry Food. Wooster Rend. Co., Auburn, Mass.	*Willimantic:* E. A. Buck & Co.
		Guaranty

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* Statement of dealer.

SAMPLED IN 1912—*Continued.*

Station No.	Pounds per Hundred.						Price per ton.
	Water.	Ash.	Protein. (N x 6.25.)	Fiber.	Nitrogen-free Extract. (Starch, gum, etc.)	Ether Extract. (Fat.)	
1266	9.24	11.42	21.50	5.80	45.94	6.10	$42.00
1208	9.70	3.84	18.44	6.02	56.63	5.37	38.00
....	....	....	17.00	.....	.....	5.50	.....
1210	10.65	3.85	17.25	5.18	57.58	5.49	41.00
....	....	.....	15.00	.....	.....	3.00	.....
1279	9.72	10.77	18.25	8.36	48.42	4.48	43.00
....	....	.....	20.00	.....	.....	3.00	.....
1240	10.24	7.36	15.31	4.85	56.65	5.59	50.00
....	....	.....	14.00	.....	.....	3.00	.....
1171	10.45	6.37	18.13	6.55	55.08	3.42	48.00
....	....	.....	17.00	.....	.....	3.00	.....
1225	6.86	8.12	20.00	5.13	53.90	5.99	43.00
1245	9.62	9.08	23.00	8.28	44.44	5.58	48.00
....	....	.....	21.00	.....	.....	4.00	.....
1229	6.77	26.36	46.13	.....	.....	16.55	62.00
....	....	.....	40.00	.....	.....	10.00	.....
1158	7.18	29.41	47.63	.....	.....	11.96	57.00
....	....	.....	35.00	.....	.....	8.00	.....
1154	6.36	40.47	36.88	.....	.....	10.00	55.00
....	....	.....	40.00	.....	.....	8.00	.....
1346	10.17	31.37	54.69	.....	.....	2.00	55.00
....	....	.....	45.00	.....	.....	2.00	.....
1331	6.34	31.13	46.88	.....	.....	11.19	51.00
....	....	.....	40.00	.....	.....	8.00	.....
1345	3.52	51.06	28.63	.....	.....	10.12	45.00
....	....	.....	30.00	.....	.....	10.00	.....
1280	7.79	38.60	37.00	.....	.....	12.17	55.00
....	....	.....	35.00	.....	.....	15.00	.....
1146	8.94	17.96	57.00	.....	.....	14.88	63.00
....	....	.....	55.00	.....	.....	10.00	.....
1287	6.18	35.11	46.63	.....	.....	9.70	50.00
....	....	.....	40.00	.....	.....	8.00	.....
1236	5.32	38.38	40.06	.....	.....	10.92	55.00
....	....	.....	40.00	.....	.....	8.00	.....
1250	7.79	31.19	43.69	.....	.....	12.59	55.00
....	....	.....	45.00	.....	.....	10.00	.....
1311	7.23	31.10	46.38	.....	.....	10.67	54.00
....	....	.....	40.00	.....	.....	8.00	.....

per ton for his feeds than he did in 1899, nine of the thirteen feeds showing an increase of 59 per cent. or over. In this era of high prices the financial success of the dairyman depends to a very great degree on the prices he is paying for his feeds. He buys, or should buy, most of his feeds for the protein they contain. The carbohydrate feed at $30 per ton is a luxury that few dairymen can afford. Probably the time will never come when the average feeder can raise on his farm all the feed required by his stock, but certainly intelligent management can greatly reduce the amount he need purchase. No feeder can afford to purchase under any circumstances, at the prices asked for them, corn cobs, oat hulls and weed seeds. Soaking weed seeds with molasses, or mixing a little cotton seed meal or gluten feed with oat hulls does not by any magic process endow these products with a nutritive value they never possessed and never can possess. The purchase of small amounts of high-grade feeds mixed with relatively worthless material under the guise of some wonderfully effective special mixture bearing a proprietary name is never economical. The feeder has plenty of roughage of this sort already at hand on his farm. With city feeders, who are obliged to buy all their feeds, these arguments of course have less weight, but even with these a considerable economy may be effected by a careful scrutiny of the guaranty, the ingredients used, the chemical analysis and the price asked.

FEED DEFINITIONS.

Following are the definitions of the various commercial feeds which have been formally adopted by the Association of Feed Control Officials of the United States:

Alfalfa meal is the entire alfalfa hay ground, and does not contain an admixture of ground alfalfa straw or other foreign materials.

Blood meal is ground dried blood.

Brewers' dried grains are the properly dried residue from cereals obtained in the manufacture of beer.

Buckwheat shorts or buckwheat middlings are that portion of the buckwheat grain immediately inside of the hull after separation from the flour.

Chop is a ground or chop feed composed of one or more different cereals or by-products thereof. If it bears a name descriptive of the kind of cereals, it must be made exclusively of the entire grains of those cereals.

Clipped oat refuse (term oat clippings not recognized) is the resultant by-product obtained in the manufacture of clipped oats. It may contain light, chaffy material broken from the ends of the hulls, empty hulls, light, immature oats and dust. It must not contain an excessive amount of oat hulls.

Corn bran is the outer coating of the corn kernel.

Corn feed meal is the sifting obtained in the manufacture of cracked corn and table meal made from the whole grain.

Cornstarch by-product with corn bran is that portion of commercial shelled corn that remains after the separation of the larger part of the starch, and the germ by the processes employed in the manufacture of cornstarch and glucose. It may or may not contain corn solubles.

Cornstarch by-product without corn bran is that part of commercial shelled corn that remains after the separation of the larger part of the starch, the germ and the bran by the processes employed in the manufacture of cornstarch and glucose. It may or may not contain corn solubles.

Cottonseed meal is a product of the cottonseed only, composed principally of the kernel with such portion of the hull as is necessary in the manufacture of oil; provided that nothing shall be recognized as cottonseed meal that does not conform to the foregoing definition and that does not contain at least 36 per cent. of protein.

Choice cottonseed meal must be finely ground, not necessarily bolted, perfectly sound and sweet in odor, yellow, free from excess of lint, and must contain at least 41 per cent. of protein.

Prime cottonseed meal must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, yellow, not brown or reddish, free from excess of lint, and must contain at least 38.6 per cent. protein.

Good cottonseed meal must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color and must contain at least 36 per cent. of protein.

Cottonseed feed is a mixture of cottonseed meal and cottonseed hulls, containing less than 36 per cent. of protein.

Cracklings are the residue after partially extracting the fats and oils from the animal tissue. If they bear a name descriptive of their kind, composition or origin, they must correspond thereto.

Digester tankage is the residue from animal tissue exclusive of hoof and horn specially prepared for feeding purposes by tanking under live steam, drying under high heat, and suitable grinding. If it contains any considerable amount of bone, it must be designated **digester meat and bone tankage.**

Distillers' dried grains are the dried residue from cereals obtained in the manufacture of alcohol and distilled liquors. The product shall bear the designation indicating the cereal predominating.

Flax plant by-product is that portion of the flax plant remaining after the separation of the seed, the bast fiber and a portion of the shives, and consists of flax shives, flax pods, broken and immature flax seeds and the corticle tissue of the stem.

Grits are the hard, flinty portions of Indian corn without hulls and germ.

Hominy meal, hominy feed, or hominy chop is a mixture of the bran coating, the germ and a part of the starchy portion of the corn kernel obtained in the manufacture of hominy grits for human consumption.

Malt sprouts are the sprouts of the barley grain. If the sprouts are derived from any other malted cereal, the source must be designated.

Meal is the clean, sound, ground product of the entire grain, cereal or seed which it purports to represent: Provided, that the following meals, qualified by their descriptive names, are to be known as, viz.: **Corn germ meal** is a product in the manufacture of starch, glucose and other corn products and is the germ layer from which a part of the corn oil has been extracted. **Linseed meal** is the ground residue after extraction of part of the oil from ground flaxseed.

Meat scrap and meat meal are the ground residues from animal tissue exclusive of hoof and bone. If they contain any considerable amount of bone, they must be designated **meat** and **bone scrap,** or **meat** and **bone meal.** If they bear a name descriptive of their kind, composition or origin, they must correspond thereto.

Oat groats are the kernels of the oat berry with the hulls removed.

Oat hulls are the outer chaffy coverings of the oat grain.

Oat middlings are the floury portion of the oat groat obtained in the milling of rolled oats.

Oat shorts are the covering of the oat grain lying immediately inside the hull, being a fuzzy material carrying with it considerable portions of the fine floury part of the groat obtained in the milling of rolled oats.

Red dog is a low grade wheat flour containing the finer particles of bran.

Rice bran is the cuticle beneath the hull.

Rice hulls are the outer chaffy coverings of the rice grain.

Rice polish is the finely powdered material obtained in polishing the kernel.

Screenings are the smaller imperfect grains, weed seeds and other foreign material having feeding value, separated in cleaning the grain.

Shipstuff or wheat mixed feed is a mixture of the products other than the flour obtained from the milling of the wheat berry.

Shorts or standard middlings are the fine particles of the outer and inner bran separated from bran and white middlings.

Wheat bran is the coarse outer coatings of the wheat berry.

Wheat white middlings or white middlings are that part of the offal of wheat intermediate between shorts or standard middlings and red dog.

PART V.

REPORT OF THE BOTANIST FOR 1911 AND 1912.

G. P. CLINTON.

I. NOTES ON PLANT DISEASES OF CONNECTICUT.

A. DISEASES PREVALENT IN 1911 AND 1912.

Weather Conditions in 1911. The winter of 1910-11 was rather open, with very little extremely cold weather. Snow was not abundant, and the little that fell did not cover the ground long. During January and February there were a number of rainy days. As this moist, warm weather was not followed by a sudden cold snap, comparatively little winter injury resulted.

There were two late frosts during the first week of May that injured some of the fruit blossoms, especially cherry and certain varieties of apple, also tomatoes that had been set out early, but on the whole the injury was not extensive. In case of the apples, the pistils were frequently the only part of the blossoms hurt. Some of the very young leaves were also injured, causing them to have a stunted appearance, with the epidermis loosened, in a wrinkled irregular fashion, from the apparently thickened tissues beneath. The spring, on the whole, was rather dry and warm.

June and July were extremely dry, with very hot periods in the latter month, causing an unusual scald of apples and, to a less extent, of peaches. Gooseberries were even baked on the bushes. This drought, perhaps the worst of those that have occurred during the last five years, was extremely hard on vegetation in general, and especially so on certain market garden crops and on trees that had suffered previously from drought and winter injury. Hail during the summer caused some damage to tobacco and apples in certain restricted localities. From the middle of August on, the moisture was sufficient for most plants, though it could not overcome the previous ill effects of the drought on some crops. An early frost, coming about September 13, cut the season rather short, and caused considerable injury to corn and late tobacco.

Diseases Prevalent in 1911. On account of the comparatively dry spring and very dry early summer, fungous diseases were not prominent, especially those that get their start in the spring. Among the more prominent may be mentioned the following: Sun Scorch, Sooty Blotch and Speck Rots (due chiefly to Black Rot and Fruit Speck) of apple; Scab of beets, prominent in the vicinity of Norfolk; Leaf Spot of celery; Black Knot of cherry and plum; Bark Disease of chestnuts, especially bad, apparently because of drought injury to the trees; Anthracnose of cucumber and muskmelon, and also Leaf Mold of the latter host; Leaf Scorch of hemlock, etc.; Bacterial Blight of pear; Tip Burn of potatoes; Mildew of rose; Calico and Pole Burn of tobacco.

On the other hand, certain diseases were less conspicuous than usual, and in some cases not seen at all. Among these were: Rust and Scab of apple, less prominent than usual because of the comparatively dry spring; Rust of asparagus, not uncommon at the end of the season, but late in starting, and so not especially injurious; Anthracnose of string beans, apparently quite inconspicuous; Mildew of Lima beans, not found at all; Brown Rot, causing little injury to cherry and plum, and not so much as usual to peaches; Leaf Curl of peach, comparatively inconspicuous; Scab of pear, very much less than usual, even on susceptible varieties; Late Blight of potatoes, entirely absent except in the northwestern part of the State, where it caused a little rot of the tubers; Rust of quince, less prominent than usual.

Weather Conditions in 1912. The year 1912 presented weather conditions rather different from those of the preceding year. In the first place, the winter was unusually severe, some of the coldest weather for years being recorded during January. As this followed much warm weather in December, it killed a good many fruit buds, particularly peaches, so that this crop was quite light, especially inland. This cold also produced some injury to the wood of peach trees, but not nearly so much as in some of the preceding severe winters.

The spring was very wet in April and May, and as considerable rain had soaked into the ground during the winter, this largely replenished the supply greatly depleted by the drought of 1911. This wet spring put back the earlier crops considerably, and late frosts about the middle of June added further to their troubles. These frosts injured garden crops considerably, and even killed the leaves of certain trees in the northern part of the State. The wet spring, however, favored forage crops as a whole.

June and July (to the middle), however, showed another long drought period, but this was not so hot as that of the preceding year, and because of the supply of water in the ground, the deep-rooted crops did not suffer much. From the middle of July on, while some localities suffered from lack of rain, most of them had enough scattered rains to mature the crops in good shape, except potatoes, and, in some cases, onions.

Another factor that made the season a favorable one for vegetation in general was the very late appearance of the fall frosts. While very slight frosts occurred the last of September and the first of October, these only partially killed the most tender plants, as melons, etc. The first heavy frost did not occur until November 2, thus giving in the end an unusually long growing season despite the late spring. On the whole, the season was much more favorable to vegetation than the preceding one. Peach trees showed the best foliage conditions for some years.

Diseases Prevalent in 1912. Fungous diseases were more prominent this year than the preceding, especially those that developed into prominence because of the wet spring. Among those occurring abundantly may be mentioned the following: Black Rot of apple, on the foliage, and Rust and Scab on the same host, especially the former, were abundant. The Cedar Apple, *Gymnosporangium macropus,* Plate XVIII c, which is the III stage from which the apple rust develops, was also unusually common in the spring, thus accounting for the abundance of the apple rust which followed later.

Rust of white ash, *Æcidium Fraxini,* was also very common, being sent in for identification from a number of localities, especially along the shore. It was prominent there because the III, or mature stage, of this rust occurs on marsh grass, Spartina sps., which is common along the shore. The appearance of the I stage on the ash is shown in Plate XVII a.

Orange Rust of blackberry, etc., was more common than usual, as was also the Anthracnose of cherry. Sun Scorch and Black Spot of maple were not uncommon. The Bark Disease of chestnut, on the other hand, seems to have been set back somewhat by the moisture conditions more favorable to its host, since a number of observers reported fewer infections, and old cankers with less vigorous development than in the preceding year. Bacterial Rot of cabbage did some damage in certain fields, and will be described later in this report. Anthracnose of currants caused considerable harm by premature defoliation.

Leaf Spots of horse-chestnut and Boston ivy were more conspicuous than usual. Leaf Mold of melons caused considerable injury, so that the sprayed vines did much better than those unsprayed. Leaf Curl of peach was more conspicuous by far than we have ever seen it, due to the favorable wet spring; and Scab was also conspicuous. Brown Rot, on the other hand, did comparatively little harm except to certain early varieties like the Champion. This was due in part to the light crop, and in part to the rather dry weather at harvest time. The Bacterial Blight of pear and quince and the Rust of the latter host were more prevalent than usual, though not very serious. Early Blight of potatoes developed somewhat, and there was considerable Tip Burn, but little or no Late Blight. There were a few complaints of Yellows of raspberry and Mildew of rose.

Beside the preceding, there were reported during the two years a number of new or unusual troubles which we shall describe more in detail under the following heads:

B. DISEASES OR HOSTS NOT PREVIOUSLY REPORTED.

APPLE, *Pyrus Malus.*

RUST, ORANGE, *Ræstelia aurantiaca* Pk. We have already reported two other species of rusts on the leaves and fruit of apple, but this is the first species we have seen occurring on the stems. This, however, is rather characteristic of the present species, as we have found it on other hosts, the quince and Cratægus, not uncommon on the twigs. It was sent to the Station from two different localities during the past season, but evidently is not very common on the apple, as we have never collected it ourselves on this host. It forms fusiform swellings on the twigs, and in these the fragile, white peridia, or fruiting cups, develop, and upon opening disclose a mass of bright orange-colored spores that by their color and microscopic characters are easily distinguished from the other two species previously reported. One of the specimens sent in the late fall showed the young twig swollen and still alive, while the fruiting pustules had not yet developed. This indicated that the twig might live over the winter and develop this stage the following spring. Ordinarily these swellings develop their fruiting bodies, and then are gradually killed by the fungus, so that the next season no further development occurs on them or on the uninjured portion of the twig below, thus showing that the fungus is not perennial on the host. The III, or Gymnosporangium, stage of the fungus occurs on both the red cedar and the common juniper in spring, and is spread from these to its alternate rosaceous hosts, among which, besides those already mentioned, is the Juneberry.

BANANA, *Musa sapientum.*

ANTHRACNOSE, *Glœosporium musarum* Cke. & Mass. This fungus is not uncommonly found on bananas in our markets. It causes a blackening and dry decay of the skin. Eventually the fruiting stage shows as small, pinkish, more or less numerous exudations. If kept in a moist chamber, these become much more prominent. Cultures are easily obtained, and these produce only the conidial stage. As these cultures differ somewhat in appearance from those of the bitter rot of apple, and never with us have developed any asco-stage, we believe Shear is correct in considering it a distinct species. It is doubtful if *Myxosporium Musae* B. & C. (Grev. 3: 13), later issued by Ellis and Everhart (N. A. F. n. 2672) as *Glœosporium Musae,* is different, if we judge by the Ellis specimen, though the original description gives the spores as somewhat smaller than in the species under consideration here.

CABBAGE, *Brassica oleracea.*

BLACK BACTERIAL ROT, *Pseudomonas campestris* (Pamm.) Smith. Pl. XX a-b. This disease occurs on a number of related cruciferous plants, but we have reported it from this state before only on cauliflower. While we did not see it on cabbage until last season, it seems quite probable that it has caused more or less harm to this host before, since it has been reported as quite injurious in several other Eastern states in times past. The trouble was called to our attention last year by a request, late in September, from H. B. Cornwall of Meriden to visit his farm and see what was the matter with his cabbages. Inspection showed that the trouble, which was quite serious, was this bacterial disease. Although Mr. Cornwall had grown cabbage for some years, this was the first time that he had noticed trouble of this sort.

From what we could learn from Mr. Cornwall, the disease apparently started in his cabbage from the seed of Danish Bald Head, which was imported. This variety was by far the most infected, and in looking over the old seedbed, we found several stunted seedlings of this variety that showed the disease. Mr. Cornwall also gave some of the young plants to several of his neighbors, and an examination of their fields showed the disease on this variety, but not usually on the others.

Mr. Cornwall did not notice the trouble until about the middle of September, when, following a spell of muggy weather, this variety began to go down rapidly. Several other varieties, such as Copenhagen Market, Flat Dutch, and Savoy, showed little or none of the disease, although close to the Danish Bald Head. This probably means that the disease was not present in their seedlings, and that it spread to them later from the infected Danish Bald Head when the latter became badly infected. But of course it might also mean that these varieties were not so susceptible to the disease. The cabbage was on new land, and the plants were all from new seed beds. Part of the land had manure on it, and part had not, but this did not seem to make any difference. The Danish Bald Head first set out showed the trouble worse than those planted later.

This disease is recognized by the blackened veins of the leaves, Plate XX b, where the bacteria develop chiefly, and in time extend down into the head. The leaf tissues finally turn yellow, and the leaves are easily pulled off. Soft rot, caused in part by other organisms, often loosens them at the base, and develops an ill-smelling internal decay, XX a. The bacteria gain entrance through drops of water at the water pores on the margins of the leaves.

As the germs of this disease can be carried on the seed, as determined by Harding and Stewart, it is wise to see that the seed used does not come from a diseased crop. If doubt exists, it is well to treat the seed with formalin, 1-240, or corrosive sublimate, 1-1000, for fifteen minutes, as recommended by the investigators just mentioned. Likewise, if the disease shows up in a seedbed, this should be changed the next year. If bad in the field, this land should not be used for cruciferous crops for several seasons, and even if the disease is not present, yearly rotation is desirable where it can be carried on without especial difficulty. Refuse from diseased cabbages should never find its way to the manure pile.

CURRANT, BLACK, *Ribes nigrum.*

PINE-CURRANT RUST, *Cronartium ribicola* Waldh. Plate XVII b-c. In our last report, 1909-10, p. 730, we noted the finding of a few specimens of the peridial stage of this fungus, known as *Peridermium Strobi* Kleb., on recently imported white pine seedlings in several plantations in the state. These pines all came from one firm in Germany. In April, 1912, Mr. Walden, while inspecting imported nursery stock in one of the nurseries of the state, found in a shipment of three-year-old white pine seedlings, purchased from Schaum and Van Tol of Oudenbosch, Holland, at least 185 that showed the characteristic swellings or fruiting stage of this blister rust (see illustrations). The whole shipment was destroyed in consequence of this finding. Since then the United States Government has placed a quarantine on the importation of white pines into this country from any of the European countries where this disease is known to exist. Since our inspection of the plantations previously mentioned, no other examples of this rust have come to our attention, and, so far as we know, it does not exist to-day in this state.

The II and III stages of this rust occur on species of the genus Ribes, which includes our currants and gooseberries. Although occasional outbreaks of the rust on currant had been reported at Geneva, N. Y., we had never found it in this state. In 1912 Stewart, of the Geneva, N. Y., Station, reported another of these outbreaks, and later Stone, of the Amherst Station, found the disease in Massachusetts. The black currant seems to be by far the most susceptible of any of the varieties to this disease. On learning of the outbreak at Geneva, we kept watch for this rust in Connecticut, and early in October received leaves of black currants from H. B. Birdsey of Meriden which showed the III stage of the fungus. These currants, originally obtained from outside the state, had been planted in his garden about eight years, but he had not noticed this trouble before, though it may have escaped his attention. This year he noticed it because of the premature defoliation of the currants.

After locating this rust at Meriden, we visited several nurseries, and inspected their currants to see if it occurred there. We also wrote to all the nurseries in the state handling black currants, and requested them to look for the disease on the fallen leaves, as it was then late in the season, and to send us any suspicious ones. We were not able, however, to locate the rust in any of these nurseries. As black currants are not handled to any extent by our nurserymen, it is not likely that the disease occurs with them.

There are no white pines in the immediate vicinity of the rusted currants in Meriden, and Stewart has never found the peridial stage on the white pine at Geneva. This makes it look as if the rust might carry over on the currants in some way without the aid of this stage for reïnfection in the spring. In connection with Stewart and Stone, we have started, in the greenhouse, black currants that were last year badly infected, to see if the rust will again appear on them without the aid of the peridial stage. These plants were brought into the greenhouse in February, 1913, and at this writing, April 15th, although in full leaf, they had as yet shown no signs of the rust. From this it appears as if the fungus did not (at least commonly) carry over on the currants. Possibly we have not learned all about the life history of this fungus.

EVERGREENS, *Various Species.*

DAMPENING-OFF, *Rhizoctonia* sp. During the past year complaints were received of dampening-off in coniferous seedbeds. At the Station trouble of this kind was also noticed, especially among the white pines. A superficial examination of these plants, which lop over on the ground and finally rot off at the surface, showed no conspicuous growth of any fungus, but upon microscopic examination, especially after keeping the plants in a moist chamber, the characteristic mycelium of this fungus could be found in more or less abundance. Cultures were readily obtained, and while these looked very similar to those of the potato Rhizoctonia, we are not sure whether they are identical. It seems, however, to be the same thing that causes dampening-off of a variety of plants in seedbeds and greenhouses.

This same fungus was also found dampening off coniferous seedlings in the Elm City Nursery, especially those of the yew, *Taxus cuspidata*. Those in charge stated that it was almost impossible to grow seedlings of this species, as it seems to be particularly subject to this injury. They found that if, as soon as the trouble appeared, they sprayed the ground around the affected plants with Bordeaux mixture, and repeated the spraying when necessary, they could save a fair percentage of the seedlings.

Sun Scorch. This may perhaps be considered a combination of winter injury and sun scorch. Various evergreens, especially hemlock, suffered severely from this widespread trouble in the early spring of 1911. While in most cases merely the leaves were killed in greater or less numbers, yet when this injury was severe enough the plants themselves died as a result of the severe defoliation that followed. Often only the outer ends of the leaves were killed, turning a reddish-brown in contrast with the green of the uninjured portion.

The trouble was probably due to unusually warm weather in March and April, starting evaporation from the leaves while the roots were still frozen in the ground and unable to readily replace this loss. Possibly part of the trouble may have been caused by the warm, moist weather in January and February and the subsequent colder weather. Plants recently re-planted suffered more than those well rooted.

HOPS, *Humulus japonicus.*

Powdery Mildew, *Sphærotheca Humuli* (DC.) Burr. This fungus forms a whitish, powdery growth on the leaves and stems with a mature fruiting stage showing as very small, blackish, crowded specks, chiefly on the under side of the leaves. It was found rather conspicuously in the fall on the variegated variety of the Japanese hop, cultivated for ornament in the writer's yard, and caused premature death of the foliage. While this mildew has been responsible for considerable damage in the hop districts of Europe in times past, it has only recently been complained of in the hop districts of New York State. Blodgett reports that dusting the plants with sulphur is a rather satisfactory method of controlling the trouble there.

JUNIPER, CHINESE, *Juniperus chinensis.*

RUST, *Gymnosporangium japonicum* Syd. Plate XVIII d. The last of March, 1911, Mr. Walden, while inspecting importations from Japan at the Elm City Nursery, found on the above host, specially on the form known as *compacta,* an unusual rust on both stems and leaves. On a seedling of this same species, called *J. virginalis,* this same rust was also found, but only on the leaves. Altogether, 55 plants were found that had the outbreaks on the stems, and these were all destroyed. Those showing the rust only on the leaves were ordered planted in an isolated place, and an examination of them the next spring revealed no signs of the fungus. A few days after Mr. Walden found these infected specimens, he discovered others in an importation, also from Japan, of the Stephen Hoyt's Sons Nursery Company. In this case 49 plants showing the rust on the stems were destroyed. The writer determined both these collections to be the telial, or III, stage of *Gymnosporangium japonicum* Syd., which until this time had not been reported in America.

An examination of Plate XVIII c-d shows that this rust is quite different from our common red cedar rust, though apparently it is not so different from some of the other species reported from this country, especially *G. effusum.* This fungus has been well described by Shirai in Zeitschr. für Pflanzenk. 10, pp. 1-5, and he determined that the I stage is *Ræstelia koreænsis,* which is more or less injurious to the foliage of pears; and can also infect apples and quinces, in Japan.

The gelatinous swellings of the fungus evidently developed on the infected trees in transit, though they appear in Japan a little earlier than in this country. These are the fruiting bodies, or sori, and are 3-5 mm. high, more or less flattened or tongue-shaped, and run together on the stems, as shown in the illustration. On the leaves they are smaller, more isolated, more nearly conical, with one to three on a leaf. An examination of the sori showed that they contained two types of spores,—one type long, pointed, thin-walled, chiefly in the interior of the sorus, and the other smaller, thicker-walled, with round apices, less abundant, and chiefly on the exterior. Those on the leaves are as a rule smaller than those on the stem. Shirai found that insects, especially bees, were important factors in carrying the sporidia of the germinating teleutospores in these sori to the alternate rosaceous hosts.

This rust is probably perennial in the stems of the juniper, or else it takes two years for the sori to develop after infection. A juniper, which was badly rusted at the time of their discovery, was potted and placed in our greenhouse, where it has remained for two years. After the disappearance of the sori in the spring, the plant showed no signs of the rust that year or the next, but the spring following it again broke out in a different part of the stem, but not so conspicuously. Just how serious this rust might prove in its I stage on our pomaceous fruits, if it got started here, we do not know, but they certainly already have enough similar troubles.

KAFFIR CORN, *Sorghum vulgare* var.

Grain Smut, *Sphacelotheca Sorghi* (Lk.) Clint. We have reported this smut before on sorghum and broom corn. In September, 1911, we found it not only on these hosts, but also on Red Kaffir corn grown at the Experiment Station farm for experimental purposes. None of these hosts are of commercial importance in this state, so the smut is not of economic importance here, though often serious elsewhere. It changes the seeds into kernels filled with a dusty mass of brownish-black spores.

PEACH, *Prunus Persica.*

Stem Canker, *Phoma Persicæ* Sacc. This fungus has been reported previously in this country by Selby of Ohio (Ohio Exp. Stat. Bull. 92: 233. 1898. *Ibid.* 214: 423. 1910), who called it Constriction Disease of Stem, or Stem Blight. He reported it doing considerable injury in one lot of heeled-in nursery stock, and he also found occasional specimens in orchards. Selby has not since found that this was a serious trouble in his state, and apparently the pruning off of the diseased branches is the only treatment necessary. From what we have seen of it in Connecticut we do not consider it a disease likely to prove troublesome here. Apparently it develops best on trees in a weakened condition.

It was first found in Connecticut in October, 1911, by Dr. Britton, while inspecting one-year-old seedlings in one of the nurseries, and later the same nursery company sent the writer specimens, writing as follows: "We are sending you under separate cover some samples of peach twigs. These were sent us by a customer of ours in New York State. We think he planted these trees last spring, and he says that he has quite a few where the wood is black in the center and the foliage is turning yellow and the edges of the leaves have been looking bad since July 15th."

An examination of both sets of specimens showed the fruiting stage of the Phoma fungus present. The twigs were partially or completely encircled by a depressed band of dead bark of varying width. This injury does not immediately kill the parts above, as the wood there often forms a greater growth than that below the cankers, giving rise to a slight swelling, though eventually the parts above are killed. The leaves turn yellow, and finally drop off. Cutting through the wood, we found a dark streak next the cambium, below the canker, but above it this was covered by the subsequent growth of the wood which formed the swelling. The stems were brittle and easily broken off at these areas. The fruiting pustules of the fungus show as small, more or less abundant, black specks. From these there ooze out the hyaline, oblong to broadly oval spores, which are round at the ends, sometimes slightly curved, and 7-10 μ long by 3-3.5 μ wide.

PINES, *Pinus* sps.

PINE-? SOLIDAGO RUST, ***Peridermium delicatulum*** A. & K. Plate XVIII a-b. Late in June, 1912, while examining the leaves of ***Pinus rigida*** at Granby for ***Peridermium acicolum***, we not only found specimens of that rust, but also ran across specimens of another leaf rust on the same host, which was entirely different and had never been collected before in the state. This rust we determined to be *Peridermium delicatulum*, and Kern, to whom we sent specimens, verified our determination, and kindly sent specimens of the type for comparison. This rust was originally described in 1906 by Arthur and Kern (Bull. Torr. Bot. Club 33:412) from Florida on leaves of Pinus sp., and apparently had not been collected since.

The illustration shows very well some of the macroscopic differences between this species and our more common *Peridermium acicolum*. These differences are as follows: (1) The peridia of *P. delicatulum* are very inconspicuous, being deeply embedded in, and standing very slightly above, the leaf tissues, and open by a long slit; while those of *P. acicolum* stand up prominently, 1-3 mm. above the surface of the leaf, and frequently remain as white, tongue-shaped elevations after the spores are shed. (2) The fresh spore-masses of the first species are less dusty, and are crimson, as compared with the orange-colored sori of the other species. (3) Microscopically the spores are smaller (18-29μ x 17-21μ, subspherical or cuboidal to ovoid), and with minute verruculations, while the spores of *P. acicolum* are covered with coarse, scale-like tubercles.

From observations made at the time, though not proved by inoculation experiments, it seems very probable that *P. delicatulum* has, like *P. acicolum,* its III stage as a Coleosporium on Solidago. Immediately under and close to the branch of *Pinus rigida* bearing the *P. delicatulum* was found a specimen of *Solidago graminifolia* var. *Nuttallii* containing the II stage of an undetermined Coleosporium. The spores of this were very similar in color and in fine verruculations to those of *Peridermium delicatulum* on the pine, just as are those of the II stage of *Coleosporium Solidaginis* on *Solidago rugosa* similar in color and coarse tubercles to those of its peridial stage, *P. acicolum.* We have reported before that the spores of all the specimens on Solidago, etc., of the II stage of so-called *Coleosporium Solidaginis* were not alike, and an examination of specimens on *Solidago graminifolia* var. *Nuttallii* already in the herbarium showed that these had the fine verruculations of this new species. It is hoped that we shall be able later by inoculation experiments to fully determine this species on the goldenrod and connect it with the suspected stage on pine.

PINE-SWEET FERN RUST, *Peridermium pyriforme* Pk. We have already reported this fungus (which has its II and III stages on sweet fern, known as *Cronartium Comptoniae* Arth.) on *Pinus sylvestris, P. rigida, P. austriaca,* and *P. maritima,* from the Station forestry plantation at Rainbow. In May, 1911, Forester Spring found it there on *P. ponderosa,* and in May, 1912, Forester Filley and the writer found it on this host and *P. montana,* both hosts new, at least to this state. This makes six different species of pine on which we have now found this Peridermium.

STEM CANKER, ? *Phoma* sp. Plate XIX a. Several times we have had young specimens of white pine brought to us by foresters showing the base encircled by a dead sunken area, as shown in the illustration. Occasionally we have found the Phoma fruiting slightly on these dead areas, and at least in one case, we obtained this fungus in cultures from the specimens. We are not sure as yet whether this fungus is responsible for the trouble or whether it merely follows winter and drought injury. Some of the specimens have the aspect of being quite parasitic.

We have seen no notice of a Phoma canker of white pine in this country, but Tubeuf, in his Diseases of Plants, mentions two species of Phoma in Europe that attack the branches of various coniferous plants. One of these is *Phoma pithya* Sacc., and Saccardo, in his Host Index, gives the white pine as one of the hosts of this fungus. On the leaves of certain species of pine, including *Pinus montana,* we have seen *Phoma acicola* (Lev.) Sacc. It is a question with this species also whether it is parasitic or is merely following other injury where the leaves have been killed part way from the apex inward.

QUINCE, *Cydonia* sps.

FRUIT SPOT, *Cylindrosporium Pomi* Brooks. In our 1909-10 Report, page 723, we described the appearance of this fungus on the apple, and also reported finding it rarely on the common quince, *Cydonia vulgaris.* In October, 1912, the writer also found it on fruit of the Japan quince, *Cydonia japonica.* While the fruit of this was abundantly covered with small purplish discolorations, none of these showed the fruiting stage of the fungus. Cultures from the tissue, however, showed that they were caused by this fungus. Of course the fruit of this ornamental plant is of no economic importance.

ROSE, *Rosa* sp.

CROWN GALL, *Bacterium tumefaciens* Sm. & Towns. Plate XIX b. We have reported previously this bacterial disease on the following hosts: apple, bittersweet (Japanese), blackberry, peach, plum, and raspberry. Besides these, we have reported a somewhat similar trouble on the branches of oak trees, and a trouble of grapes which we have considered a winter injury, but which some others attribute to the crown gall organism. While the rose has been reported elsewhere as a host, it had not been found infected in Connecticut until Walden, in December, 1911, while inspecting Manetti stock recently imported from England by A. N. Pierson of Cromwell, discovered a few plants showing the galls conspicuously on the roots. Specimens of these have been planted in our greenhouse for over a year, and the disease does not seem to have as yet very seriously affected the plants, or to have spread to any extent to the new roots.

TURNIP, SWEDE, *Brassica campestris*.

PHOMA ROT, *Phoma Napobrassicæ* Rost. Plate XX c-d. In December, 1912, Mr. W. N. Durgy of Danbury noticed a rot trouble in his Swede turnips, and later sent specimens to the Station for information. Concerning this he wrote: "As I have a trouble with my Rock turnips this year that I never had before, I thought I would send you a sample. They were nice and solid when I put them in the cellar, and now nearly half of them are like the sample. Will you kindly report what is the cause of the trouble." Later, in answer to inquiries, he furnished the following information: "The turnips did not show any spots when they were dug. The only thing we saw when we dug them was a decay on a very few around the top, so that when we pulled them, the top would come off, but I thought nothing of this. I have not heard of any similar trouble around here. I have made a specialty of raising turnips for a good many years, and have always stored them in the same place, i. e., the cellar bottom. My cellar is warm, but not very damp. I have had the farm for sixteen years, and never raised but one crop of turnips before on the same ground, which was in 1911, but I manured it heavily with horse and cow manure, and used fertilizer besides."

An examination of the turnips sent showed that they had a dry rot, appearing as sunken, subcircular areas scattered over the roots, especially above, as in illustration c. These areas usually had a darker border, but on the samples we received we did not notice that this was purplish or that the spots were finally cracked, as described for the trouble on Swedish turnips elsewhere. A microscopic examination showed the mycelium of the fungus abundant in these spots, and apparently the cause of the decay. No fruiting bodies showed, but after placing the turnip for a few days in a moist chamber, these became abundant, as shown in illustration d. Cultures of the fungus were easily obtained, and these produced a black growth in the medium with a scanty, superficial, whitish or slightly pinkish tinted growth above. The spores exuded more or less abundantly in rose-colored, viscid masses. Mr. Stoddard readily produced the disease in healthy tubers, kept fairly moist and warm, on inoculation with spores from the cultures.

The writer is indebted to Stewart of Geneva, N. Y., for several references to this disease in other countries, but neither Stewart, Selby, nor anyone else apparently, has reported a similar trouble in the United States. So far as the writer can judge from the meager description, our disease appears to be the same as that reported by Rostrup (5-6) from Denmark in 1893. He found it on Swede turnips, and describes as its cause a new fungus which he called *Phoma Napobrassicæ*. The trouble was next reported from the north of England, by Potter (4), who first noticed it in the winter of 1896-7. He also found it on the roots in the field. Potter merely identified the disease as caused by a species of Phoma, though he noted the possibility of its being the same species described by Rostrup. Carruthers (1) also reported this trouble from Lincolnshire, England, in 1903, and he had no doubt but that the disease reported by Potter and himself was the same as that described by Rostrup.

In 1905, Kirk (3) reported the disease from New Zealand as new in that region. He gives the following description of the injury: "Below the crown, and forming a kind of irregular ring around the upper third of the turnip, are numerous more or less circular depressed areas of decaying tissue, varying considerably in size. They are light brown and corky, and are generally surrounded by a well-defined purple margin. As the disease advances, these patches crack and form deep fissures, which spread deeply into the interior of the turnip, ruining it. Numerous black dots (pycnidia) now appear on the diseased patches; these dots are cone-shaped, and contain immense numbers of minute spores, which emerge from the apices of the fructification in small, globular, rose-colored masses. The spores then soon separate, and are disseminated by various agencies, especially wind."

In 1912, Güssow (2) reported the disease from Prince Edward Island, Canada, and this seems to be the first report of the disease from North America. While we have accepted Rostrup's name for the fungus, we are not sure whether it is distinct from a cabbage fungus (*Phoma Brassicæ*, or *P. oleracea*) that has caused more or less damage in Europe and was reported in 1911 by Manns (Ohio Agr. Exp. Stat. Bull. 228: 276-89) as causing serious injury in Ohio, especially through cankers on the stems. The cabbage and turnip both belong to the same genus, and so are closely related, and the Phoma fungi found on each cause cankers, and have spores about the same size. (Manns reports the spores of the cabbage Phoma as 4.5-5μ x 1.7-2μ, while those of our turnip Phoma are chiefly 3.6-4.5μ x 1.8μ). But we do not know whether the spore masses of the cabbage Phoma are rose-colored, as are those of the turnip Phoma. Manns reports the fungus as occurring on the leaves somewhat, and McAlpine reports it on the leaves of cabbage, turnip and rape. Johnson has reported a Phoma disease on the leaves of Swede turnip in Ireland, and this may be the same as our Phoma. The other writers do not distinctly mention the Phoma as occurring on the leaves of turnips, though from the spraying treatment recommended, it is at least suggested that it may occur there.

While the different investigators have suggested various preventive treatments, it is not known yet whether all of these are practical, especially the spraying of the foliage in the field. Certainly, however, rotation should be practiced where the disease has appeared in a field. It is also quite likely that the kind and amount of manure used in the field may have some influence.

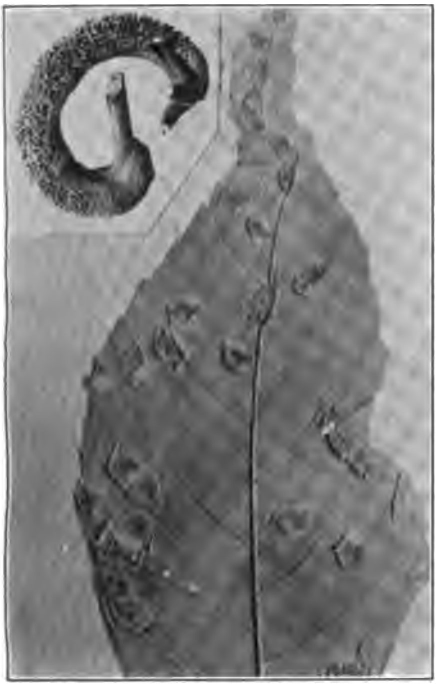
This is especially true if diseased turnips have been fed to the stock. Storage in a dry, cool place, with piles not too large, may also help to keep down the trouble. No doubt the character of the season is a factor in the development of the disease.

1. **Carruthers, W.** Diseases of the turnip bulb. Journ. Roy. Agr. Soc. Eng. 64: 297-300. 1903. [Illust.]
2. **Güssow, H. T.** Phoma rot of turnip. Exp. Farms Ottawa Rept. 1912: 202-4. 1912.
3. **Kirk, T. W.** Diseases of Swede turnip. New Zealand Dept. Agr. Div. Biol. Hort. Bull. 14: 1-4. 1905. [Illust.]
4. **Potter, M. C.** A new Phoma disease of the Swede. Journ. Bd. Agr. 6: (1-11 Reprint). [Illust.]
5. **Rostrup, E.** Oversigt over Sygdomme hos Kulturplanter. Tidsskr. Landökonom. 11: 330. 1893.
6. **Rostrup, E.** Phoma-Angriff bei Wurzelgewächsen. Zeitschr. Pflanzenkr. 4: 322-3. 1894.

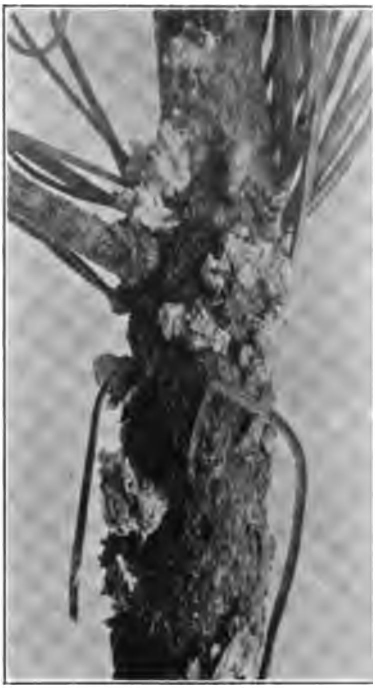
WISTARIA, CHINESE, *Wistaria chinensis.*

CROWN GALL, *Bacterium tumefaciens* Sm. & Towns. Although we do not find the above host among those mentioned by Smith as infected by the crown gall, yet so far as one can judge from macroscopic examination, it is occasionally infected in this state. Mr. Walden collected specimens in March, 1912, on plants imported from Japan in one of the nurseries, and Dr. Britton later brought us specimens from a plant grown in his yard. In the latter case the galls were associated with an elongated, sunken area of dead bark, and on this we found the fruiting pustules of a fungus that agrees fairly well with *Phoma seposita* Sacc. Whether the latter was present as a saprophyte or a parasite was not determined, but probably it was the former, since we have seen no references to it as causing injury.

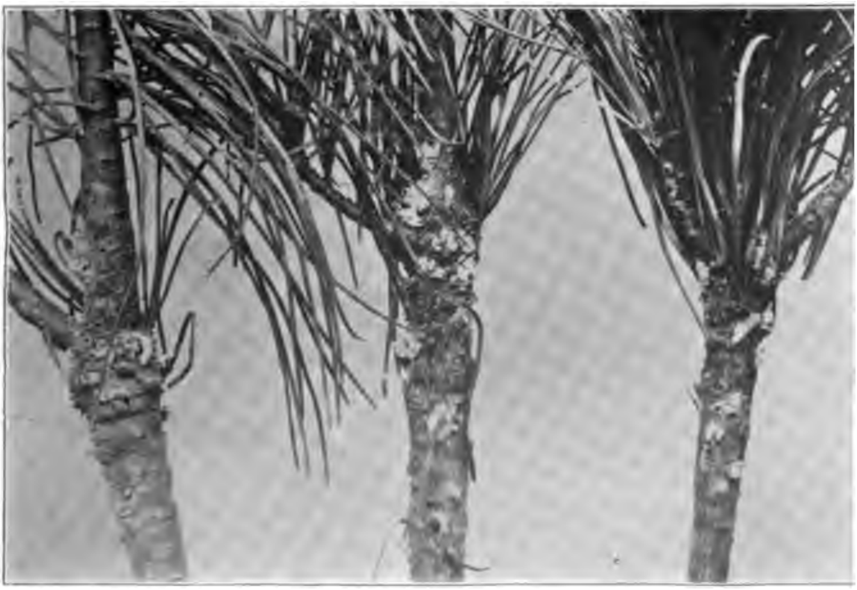
PLATE XV



a. Ash Rust, p. 343.



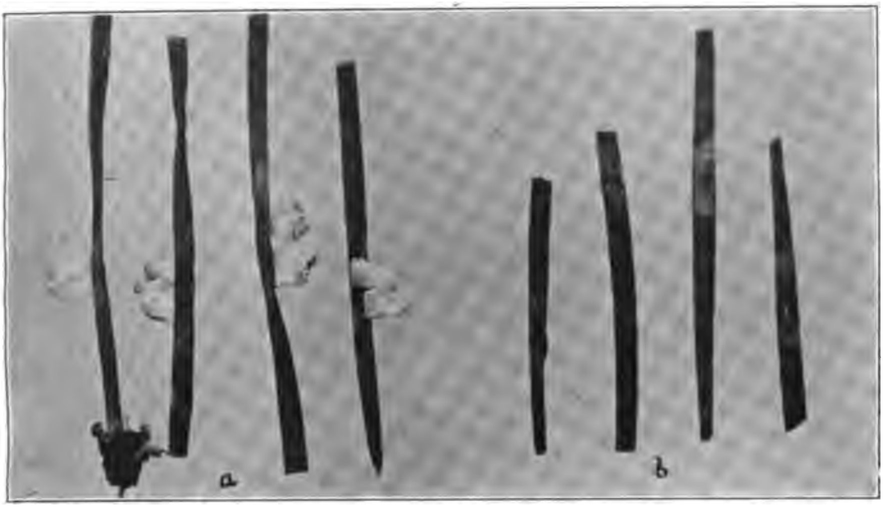
b. White Pine Rust, x 2, p. 347.



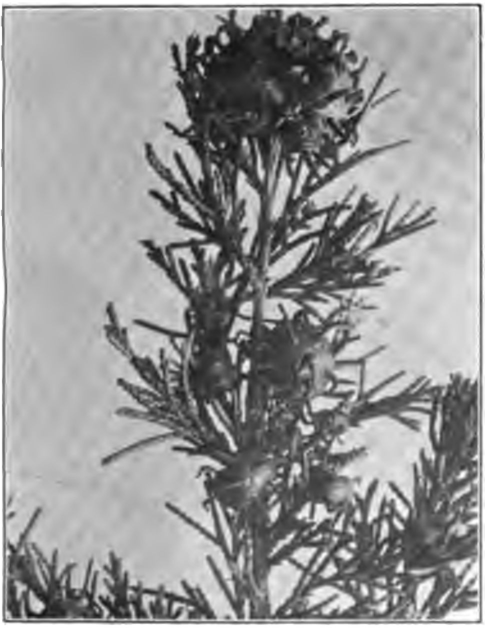
c. White Pine Rust, nat. size, p. 347.

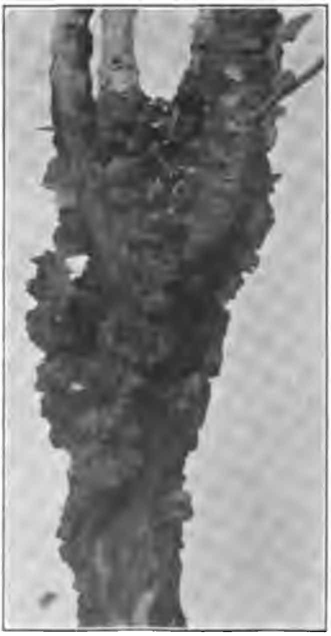
SOME TREE RUSTS.

PLATE XVIII.



a-b. Two species of Pine leaf Rusts, x 2-3, p. 352.

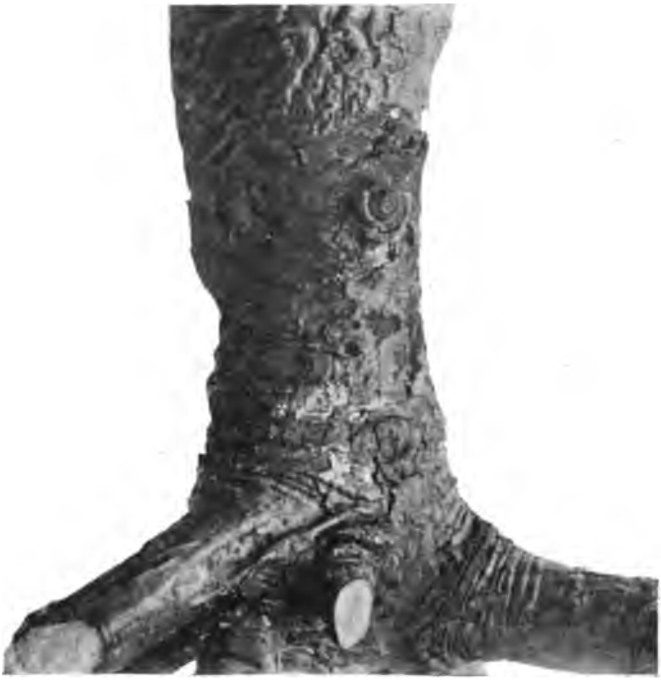




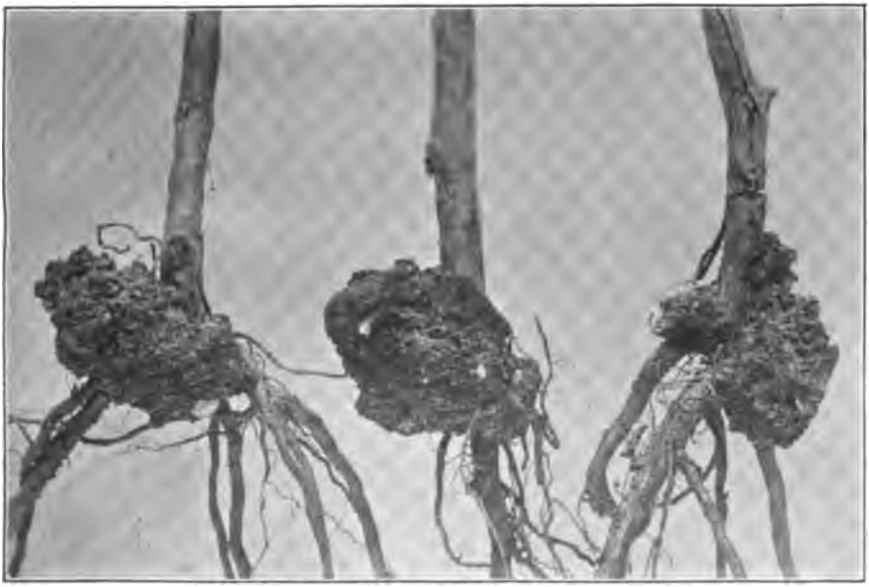
c. Common Cedar Rust, p. 343.

d. Japanese Juniper Rust, p. 350.

SOME TREE RUSTS.



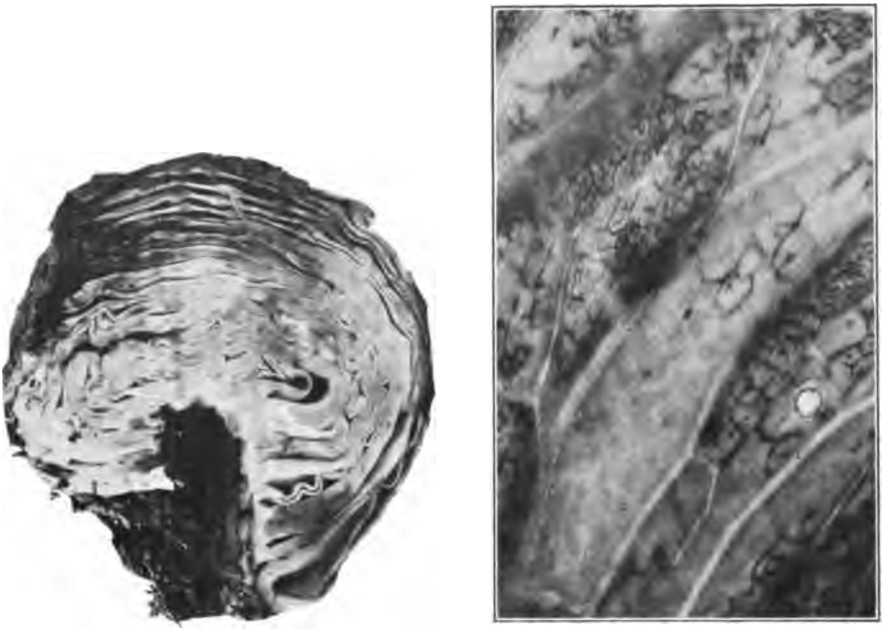
a. Canker of White Pine, p. 354.



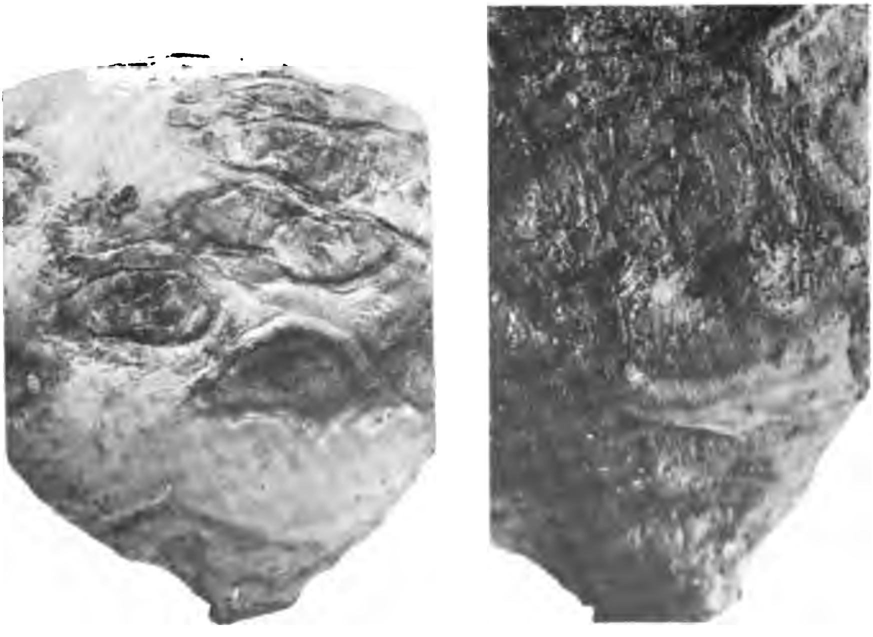
b. Crown Gall on Roses, p. 355.

DISEASES OF WHITE PINE AND ROSE.

PLATE XX.



a–b. Black Bacterial Rot of Cabbage, b. Showing blackened veins, p. 345.



c–d. Phoma Rot of Swede Turnip, d, x 2, with fruiting pustules, p. 355.

DISEASES OF CABBAGE AND TURNIP.

CHESTNUT BARK DISEASE,

Endothia gyrosa var. *parasitica* (Murr.) Clint.

HISTORICAL CONSIDERATION.

Introduction. It is now over eight years since the chestnut blight was first found in New York, and nearly six years since it was reported to this Station as occurring in Connecticut. The writer became acquainted with the trouble in 1905 through Murrill's work and specimens sent by him, and has been actively engaged in a special study of it ever since its discovery in Connecticut. Articles (5-12) concerning these studies have appeared from time to time in the Station Reports and elsewhere. Since our views have been, in part, at variance with those held by certain other investigators, we propose to give here more in detail the information we have gained during these investigations, and our conclusions therefrom.

We wish to acknowledge especial indebtedness to our assistant, Mr. Stoddard, who during the last three years has greatly aided in the work with artificial cultures, inoculation experiments, etc. Mr. Spring, the former, and Mr. Filley, the present, forester of this Station, have coöperated with the botanical department in determining the conditions in our forests and the possible remedial treatments. American and European botanists have aided with specimens and information; and we are especially indebted to Professor Farlow, of Harvard, in our systematic study of the blight fungus and its allies. We are also indebted to numerous persons interested in forestry in Connecticut for much local information.

Discovery of Disease. The chestnut blight was first noticed by H. W. Merkel, in charge of the trees of the New York Zoological Park, in the summer of 1904, as injuring scattered trees in that park. In 1905 it was so bad that he took active measures to bring it under control, and published (32) the first general description of the trouble in the Report of the New York Zoological Society for that year. The attention of Murrill, of the New York Botanical Garden, was called to the disease, which had now become quite conspicuous in the parks and woods in the vicinity of New York City, and he began a botanical study of it to determine the exact cause.

After a preliminary paper in the Journal of the New York Botanical Garden (45), published in June, 1906, he described in Torreya (47), in September of the same year, the specific fungus responsible for the trouble, a species new to science which he called *Diaporthe parasitica*.

Previous to this outbreak there is no record, so far as the writer knows, of a disease of chestnuts in this country, or elsewhere, that can be surely attributed to the same cause, though there have been troubles of chestnuts in the Southern States that may or may not have been due to it. These will be discussed more fully later. Since the disease has been called to the attention of the public, however, there are a number of persons who have reported that they believe that they have seen this or a very similar trouble previous to 1904.

For example, Metcalf and Collins (36, p. 45) say: "No earlier observation than this is recorded, but it is evident that the disease, which would of necessity have made slow advance at first, must have been in this general locality for a number of years in order to have gained such a foothold by 1904." And further on (p. 46) they add: "Observations by the junior writer indicate that this disease may have been present in an orchard in Bedford County, Va., as early as 1903, and that in Lancaster County, Pa., it was probably present as early as 1905."

Dr. Britton of this Station informs the writer that as far back as 1889 he knew of a seedling chestnut tree on a farm near Keene, N. H., that suddenly, during the summer, developed a progressive canker trouble that now seems to him to have been the chestnut blight.

Professor Davis, in the discussion at the Pennsylvania Chestnut Blight Conference at Harrisburg (54, p. 102), said: "I will say that I think I saw the blight on Long Island in 1897 or 1898. * * * That was in Cold Spring Harbor, in Huntington, especially back of Huntington, through the hills around there. So I think it was in 1898 well established in those localities." Mr. Child, of Putnam, Conn., at this same conference (54, p. 107) also said: "I know two men about sixty years of age who state that they are positive that they saw this blight twenty years ago, or something that looked the same as is shown in the blight to-day."

Early Investigations. We are indebted largely to Murrill (45-51) for our knowledge of the life history of the chestnut blight fungus. He not only gave a careful scientific description of its different spore stages, but by inoculation experiments proved that it could produce the disease in healthy seedlings. He also tried various methods of control.

The United States Department of Agriculture soon became interested in the disease, and through the efforts of Metcalf (33-39) and later of Collins (13-16) and others, facts concerning the distribution, hosts, and control of the fungus were made known. Metcalf (33) was the first to note the relative immunity of the Japanese varieties to the disease, and to suggest that the fungus was originally brought into this country from Japan. He is also, more than anyone else, to be credited for what good, if any, may arise from the attempted control of the fungus by the cutting-out quarantine method, since it is through his advocacy that this method has been undertaken in Pennsylvania and perhaps elsewhere.

The writer apparently was the next after Murrill and Metcalf to take up the special study of the disease. He was the first to try to prove that weather had some connection with the trouble, and through his investigations, in connection with Farlow, to show the relationship of the fungus to two other species found in this country, all of which are now considered species of the genus Endothia.

Recent Investigations. With the spread of the blight to new localities, and the appropriation of large sums of money by the National Government and the State of Pennsylvania for its special study and control, popular and scientific interest in this disease was greatly augmented. The more recent investigations have had to do largely with the detailed study of field conditions in the different states, especially in the State of Pennsylvania, where the force of scientific and general workers is larger than on any other special botanical investigation ever carried on in this country. This control work has been largely devised by Foresters Williams and Detwiler (19, p. 129), based on the cutting-out experiments of Metcalf at Washington (38). Recently Carleton, of the United States Department of Agriculture, has been given general control of all the work in

Pennsylvania, with Heald, formerly of Texas, in charge of the laboratory investigations.

Collins (16) has contributed to our knowledge of the treatment of individual trees. Rankin (59, 60), of New York, has reported on results of inoculation tests as to time of year, water content of trees, etc. Fulton (24), of Pennsylvania, has made a variety of field observations as to distribution of spores, conditions of infection, etc. The Andersons (1, 2) have reported on the character of the fungus in cultures, inoculation tests, etc. Craighead (17) and others have studied its relation to insects. Miss Rumbold (62, 63) has experimented with chemicals to determine their effect on the trees as regards blight resistance, etc.

Farlow (20, 21), Shear (64, 65), the Andersons (1, 2) and the writer (8-10) have studied the nomenclature and systematic relationships of the fungus. Stewart (70), Murrill (51, p. 194) and the writer have regarded unfavorably extensive control by cutting-out methods. Mickleborough (40, 41), Smith (67, 68) and others have contributed articles of interest to the general public. In Europe, von Höhnel (29), Rehm (61), and Pantanelli (52, 53) have published notes or papers on the subject.

Identity. In the study of a disease it is always very desirable to know exactly the fungus that causes it. While Murrill proved conclusively that his *Diaporthe parasitica* was the immediate cause of the chestnut blight, this did not necessarily prove, as he claimed, that it was a species new to science. The question naturally arises, has this fungus been previously known under some other name? As a vigorous parasite, killing off chestnut trees, there is certainly no record of any fungus that can be definitely identified with it. The writer from the first was skeptical about the fungus having entirely escaped previous observation by botanists, especially if it might under certain conditions exist as a weak parasite or a saprophyte. One of the first things we set about to learn, therefore, was whether or not this fungus had had a previous botanical record.

Schweinitz, a Bavarian minister, who lived at Salem, N. C., and Bethlehem, Pa., and made his botanical studies from about 1812 to 1834, was one of the first and most extensive collectors of fungi in this country. He described many species new to science. It was among the species described by him, since the relationships of many of them are now somewhat obscure, that we made a search for some fungus that might throw additional light on *Diaporthe parasitica*. In this search we asked the aid of Professor Farlow, whose knowledge of American fungi is unsurpassed, and who has some of the Schweinitzian specimens in his herbarium, and from him we first learned of the close relationship of the chestnut blight to *Endothia gyrosa* (Schw.) Fr. This fungus was first described by Schweinitz as *Sphaeria gyrosa,* from North Carolina on Fagus and Juglans. He sent specimens to Fries, a famous authority on fungi in Europe, who later recognized it as a European species, and finally placed it under a new genus, Endothia. This possible relationship of the blight was brought out for the first time in the writer's Report (6) for 1908. Neither Farlow nor the writer had at that time examined the ascospore stage of the true *Endothia gyrosa,* so the exact relationship of our blight fungus to this species was not positively determined, though the writer called attention to the fact that, so far as one could tell from the Cytospora stage, it was impossible to distinguish between *Diaporthe parasitica* collected on chestnut in America and *Endothia gyrosa* found on the same host in Italy.

Previous to this, however, Rehm (61) had decided that Diaporthe was not the proper genus for our chestnut blight, and had placed it under the genus Valsonectria, but had not questioned its identity as a new species or its relationship to Endothia.

Von Höhnel (29) seems to have been the first to definitely state that *Diaporthe parasitica* was not distinct morphologically from *Endothia gyrosa,* for in the latter part of 1909 he wrote: "Diese Pilz ist in Rehm Ascomyc., No. 1710, ausgegeben unter dem Nahmen *Valsonectria parasitica* (Murr.) Rehm. Es ist aber nicht anders als *E. gyrosa* mit schwach entwickelten Stroma." Since then Farlow (20), Shear (65), Saccardo, and Rehm, the last two in letters to the writer, have also decided that the chestnut blight fungus is not distinct morphologically from *Endothia gyrosa* (sometimes called *E. radicalis*) of Europe.

The Andersons (1) were among the last to study the relationship of *Diaporthe parasitica* to the genus Endothia. Their studies having led them to believe that the blight fungus, though related, was entirely distinct from *Endothia gyrosa*, they have placed it under Endothia as *E. parasitica* (Murr.) Anders.

Although the writer started out to prove the identity of the chestnut blight with the *Endothia gyrosa* of Europe, he has been forced to conclude from his microscopical, cultural and inoculation studies that it is not exactly identical with that species, as is held by von Höhnel and others. The relationship, however, is so close that he cannot, on the other hand, agree with the Andersons in considering it an entirely distinct species. Hence he (9) has placed it as a variety under that species, calling it *Endothia gyrosa* var. *parasitica* (Murr.) Clint.

The preponderance of opinion of those who have made a critical study of the fungus, therefore, is that it is not an entirely new species, but that it is merely a strain, or at most, a variety of a previously described saprophytic or semi-parasitic species, that for certain reasons has now attained unusual virulence in the northeastern United States.

CHARACTERISTICS OF THE DISEASE.

As to the Host. It is easy enough to distinguish this disease on the smooth bark of sprouts or young trees, Plate XXIII a, since it forms definite cankers by killing the infected bark, and these usually increase in size until the entire stem or limb is girdled. These cankered spots are slightly sunken, and distinguished from the healthy bark by a chestnut-brown color, whereas the normal bark is more of a greenish-brown. Often the bark on these cankered spots is more or less cracked, and in time the fruiting pustules show as numerous minute cushions projecting through lenticel-like openings.

On the rough bark of the older trees the cankers do not show very distinctly, though when cut out, as shown in Plate XXIII b, they give a cankered effect. Frequently with these the whole bark becomes infested, and the presence of the fungus is shown by the fruiting pustules breaking out from the deep cracks of the bark. Often when these do not develop, the bark may look healthy, but when hit by a hammer, it gives a hollow sound and is easily separated from the wood, showing the cambium entirely dead. After the tissues are killed, one is apt to find the larvae of beetles, etc., at work between the bark and the wood, and their presence has led some to think that they were the real cause of the trouble.

The first appearance of the disease on the smooth bark frequently seems to be due to the injuries caused by bark miners, Plate XXIV a. The most frequent starting points, however, are through cracks, wounds or where a branch has been pruned, XXIV b, or killed from some cause, as winter injury. Very frequently the fungus gets a start from a crack in the crotch of the limbs.

In summer time the disease is recognized in the top of the trees, even at some distance, by the dead leaves on certain branches, which have been girdled, but whose girdled area is not easily seen from the ground, Plate XXII a. These dead leaves adhere for a long time to the branches. They first begin to show about the latter part of June or the first of July, when the previous year's canker has finally succeeded in girdling the branch. In the winter these dead branches sometimes retain their dead foliage and burs long after those from healthy branches have fallen. This is true, however, of a branch killed prematurely from any cause.

The cankers on the main trunk, as they become serious, cause the latent or adventitious buds in the healthy tissues beneath to develop, so that in time there are produced a number of slender sprouts, and one can detect the presence of a canker high up in the tree by these.

The fungus, while it kills the bark and cambium, and thus eventually the tree, is not a true wood-destroying species. When the trunk of a living, but cankered, tree is cut and barked, the cankered spot, Plate XXIII d, is usually visible as a darker area in the wood corresponding to the cankered spot in the bark, the mycelium of the fungus having injured the woody tissues for a short distance inward. Such cankered spots can sometimes be seen on telephone poles used along the highway. This injury in itself, however, is negligible so far as it affects the value of the pole.

Often, after trees are cut, the stumps of those infected at the base develop a vigorous growth of the fruiting stage on the three or four outer rings of wood. This probably means that the mycelium can penetrate thus far into the wood from the canker, or possibly it may mean that fresh infection takes place from spores developing in the nutrient material furnished by the exposed sapwood.

After an infected tree has been killed, or has been cut before death, there may be a further development of the fruiting stage of the fungus. We doubt, however, if disease-free trees often develop prominent infection after cutting. In other words, the fungus is parasitic or semi-parasitic, but does not develop in its prime as a saprophyte. Even on trees killed suddenly and left standing, Plate XXII b, we have often failed to notice a general spread of the fungus through the bark. In the wood pile, too, while the fruiting stage no doubt shows some increase, a general subsequent infection of the disease-free bark does not seem to take place.

As to the Fungus. The mycelium of the fungus ramifies through the bark, beneath it, and often into the wood for a short distance. When the epidermis of a young, smooth, cankered branch is carefully peeled off, it often shows the mycelium as a whitish or yellowish coating just beneath, and below this is the reddish-brown diseased bark sharply marked off at its edges from the healthy white tissues. In the older infected bark, the mycelium is sometimes seen as fan-shaped areas between the tissues or on the wood. The mycelium often gives a mottled effect to the bark as seen when cut through. In time, with the aid of insects, it produces soft, semi-dusty spots in the firmer, less affected tissues.

The infected tissues do not show external signs of the fungus itself at first (with artificially inoculated cankers, not for two months or more after inoculation, Plate XXV b), but in the smooth bark in time numerous fruiting pustules are gradually protruded through small, lenticel-like openings. These at first are quite small, but in time show as subspherical to irregularly oblong cushions one-eighth of an inch or less in length and about that in height, XXIV c. In the rough bark they break out more irregularly from the crevices, and are more run together into compound groups, XXIV d. They vary in color with age from light-orange through almost crimson- to dark chestnut-brown. The interior of the pustules is usually lighter colored, and more uniformly remains of a yellow tint. When fully matured, the fruiting pustules show small black dots on the surface or in cross-section, which are the ducts through which the matured spores escape.

On the wood, the fruiting pustules are usually simple, smaller, conical in shape, and apparently do not produce the mature stage of the fungus. They have an appearance to the eye quite different from those on the bark, and for this reason Saccardo formed a distinct genus, Endothiella, for them.

The pustules, within inconspicuous cavities, soon begin to form a summer, or conidial, stage. This, if it were the only stage produced, would place the fungus in the imperfect genus Cytospora, so this is sometimes known as the Cytospora stage of the fungus. The spores are produced apically in great numbers from slender fruiting threads. When filling the cavities and swollen by moisture, they ooze out over the surface of the pustules as drops, or more frequently, slender yellowish tendrils. These tendrils are most conspicuous in summer just after rainy weather. Soon, however, they become worn or washed away by rains, and, if carried to cracks in the bark, they cause new infection.

As the spore masses are viscid and moist, they easily adhere to insects, especially when crawling over them in the larval stage, and to the feet and beaks of birds, and these are considered means of spreading infection, not only in the neighborhood, but also to distant points. These spores, Plate XXVIII i, are very minute, in fact, so small that it would take two or three hundred million to cover an area an inch square. They are hyaline, oblong, unicellular with rounded ends, and about $2.5\text{-}4 \times 0.75\ \mu$ in size.

In the same fruiting pustules that produce the Cytospora stage there appears, after some time, the mature spore stage, often called the winter stage, because it occurs most commonly from late fall to late spring. However, like the summer stage, this winter stage can be found more or less abundant at any time of the year, its appearance depending in part on the age of the fruiting pustules. With the beginning of this stage, the fruiting pustules have reached their maximum growth and the production of the summer spores is practically over. It is quite unlike the Cytospora stage in that the spores are borne in sacs, or asci, situated in special receptacles called perithecia.

The mature perithecia, Plate XXVIII k, are minute, light to dark-colored spherical bodies, situated within, but generally beneath and around, the edge of the pustules. By means of long black necks these perithecia open on the exposed surface of the fruiting pustules, where they show as minute black specks called ostioles. With the later growth and wearing away of the fruiting pustules these ostioles sometimes project as short spines. Each perithecium contains numerous, hyaline, oblong, asci, Plate XXVIII f, tapering somewhat at their base, within which are eight ascospores arranged one above another in one or two rows. In size the asci usually vary from 40 to 45 μ in length by 7 to 9 μ wide, though some vary from 37 to 50 μ in length.

The ascospores, Plate XXVIII c, are hyaline, oblong to broadly oval, with a central septum, at which they are often slightly constricted. These spores are usually rounded at the ends, though sometimes somewhat pointed at one or both ends. They vary from 6 to 10 μ in length by 2.75 to 5 μ in width. While the chief time of germination of the ascospores is undoubtedly in the spring, their production and germination seems to be more or less distributed throughout the year. After rainy weather they are shot through the ostioles of the perithecia with some little force, and no doubt may be carried much further by the wind. By this means their distribution is greatly facilitated, and, because of their greater vigor, some experimenters believe they are more important in producing infection than the conidial spores.

Progress of Disease. From our inoculation experiments it is evident that seedling trees one-half inch or less in diameter may be girdled, and in some cases their tops killed in one season, Plate XXV a. Sprouts an inch or more in diameter may likewise be entirely girdled for a distance of six or more inches, so that the death of the parts may be expected at least by the following spring. We have not inoculated the large limbs of trees, neither have we measured the rate of growth of cankers on the same, but we have had under general observation, for several seasons, marked trees at both Stamford and Middlebury.

From the results of these observations, it seems to take at least two, and more frequently three, four or more years, to entirely kill the larger trees.

The trees at Stamford were on the farm of Mr. F. V. Stevens, and we are indebted to him and his son for aid in the experiments there. The trees were first marked by the writer and Mr. Filley in April, 1909. At that time many of them were in bad condition, as they were in the region where the blight first made its appearance in this state. All of the trees and sprouts in a certain area were numbered, and their condition as regards blight recorded. They varied in size from sprouts 2 to 8 inches in diameter to large trees two feet in diameter. The following table shows their condition when first examined, and after two growing seasons. They were not examined in 1911. In 1912, according to Mr. Stevens, Jr., all of the infected trees were dead; some of the sprouts, especially those developed since the marking, however, were alive. In 1910 some of the dead sprouts did not show any, and others but little signs of the fungus, and their death may have been partly due to other causes, as drought and winter injury, though all are included in the following table.

	Sprouts, 2-8 in. diam.				Trees, 10-24 in. diam.			
	Apr. 1909.		Nov. 1910.		Apr. 1909.		Nov. 1910.	
	No.	%	No.	%	No.	%	No.	%
Free	26	25.7	7	6.9	7	29.2	0	0
Little diseased	28	27.7	10	9.9	8	33.3	1	4.2
Moderately diseased	14	13.9	4	4.0	2	8.3	3	12.5
Badly diseased	24	23.8	15	14.8	2	8.3	10	41.7
Dead	9	8.9	65	64.4	5	20.8	10	41.7
Totals	101		101		24		24	

The trees at Middlebury, all above six inches in diameter, were in a grove belonging to the Whittemore estate. For their experimental use the Station is indebted to the farm superintendent, Mr. W. M. Shepardson. The trees were on a hillside having a southern exposure, and had recently been thinned, by taking out those most diseased. They no doubt suffered from blight more severely because of winter and drought injury, due in part to their exposure and the thinning. The trees were first examined in February, 1910, and marked, but not numbered, with a sign indicating their condition as to the disease at that time. They were examined again and re-marked at the end of that season, and examinations were made again at the end of the seasons in 1911 and 1912. In these later examinations data were not taken from all of the marked trees, but the condition of each tree examined was compared with its condition in the fall of 1910. The badly diseased and dead trees increased from 5.7 per cent. in the spring to 35 per cent. in the fall of 1910, to 58 per cent. in 1911, and to 69 per cent. in 1912. The following table shows the conditions at the different times of examination:

	Feb. 1910.		Nov. 1910.		Fall, 1910.		Fall, 1911.		Fall, 1910.		Fall, 1912	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Not diseased......	67	42.7	0	0	24	20.5	0	0	12	21.8	0	0
Little diseased.....	67	42.7	68	43.3	40	34.2	25	21.4	25	45.5	8	14.5
Medium diseased..	14	8.9	34	21.7	22	18.8	24	20.5	9	16.4	9	16.4
Badly diseased....	9	5.7	55	35.0	31	26.5	44	37.6	9	16.4	21	38.2
Dead..............	0	0	0	0	0	0	24	20.5	0	0	17	30.9
Totals.........	157		157		117		117		55		55	

DISTRIBUTION AND HOSTS.

In the United States. The blight, first noticed in the late summer of 1904 at Bronx Park, New York, was said by Merkel to have spread by the end of 1905 so that 98 per cent. of the trees in this borough were infected. Murrill (45), in June, 1906, reported the disease from New York, New Jersey, Maryland and Virginia, and in September also from the District of Columbia. In February, 1908, he (48) gave Connecticut and Massachusetts as additional states. Metcalf and Collins (36) showed the distribution by August, 1909, to include Rhode Island, Pennsylvania and Delaware. Except in the vicinity of New York City, including adjacent parts of New York, Connecticut, Long Island and New Jersey, the points of infection at this time, so far as known, were scattered rather than general. In May, 1910, Metcalf and Collins (37) included West Virginia among the infected states. The past year the disease has been reported also from New Hampshire and Vermont.

At the present time the most damage caused by this disease in Massachusetts and Connecticut has been along and west of the Connecticut river. In New York it is conspicuous along the Hudson River up to Albany, and in western Long Island.

In New Jersey the chestnuts of the whole state have suffered. In Pennsylvania the trouble is serious in the eastern half, and quite bad in the southeastern part. The disease occurs generally in Delaware, but is especially bad in the northern counties, where the chestnuts are most abundant. Maryland and Rhode Island have the disease scattered, and serious in certain localities. In Virginia and West Virginia the infections are apparently few and inconspicuous.

In Connecticut. The first specimens from Connecticut were sent to the Experiment Station in November, 1907, by F. V. Stevens, Jr., of Stamford, who found the disease doing considerable damage in this region during the summer. He also mentioned that he thought he had seen it in one or two other towns in the state. Since that report others have stated to us that they had seen the disease earlier, but had not known its nature at the time. For example, Mr. G. H. Hollister, of Keney Park, Hartford, said that in the summer of 1905 he found a tree on the Edgewood Park estate at Greenwich that he is now sure had the blight. Forester Spring reported that a farmer in the town of Easton noticed the disease as early as 1905. These three towns are all in Fairfield County, near the first reported outbreak in New York.

Hodson (28) reported the blight in New London County as early as 1908. Mr. N. J. Peck brought us a specimen from Woodbridge, New Haven County, in the winter of 1909, and reported that he had seen it in his woods for four or five years. The first fruiting specimen collected by the writer outside of Stamford was found at Morris Cove, New Haven County, in September, 1908, though immature specimens were seen that spring in Westville.

By the end of 1908 the disease had been reported in all but one of the twenty-three towns of Fairfield County, in eight towns of New Haven County, and in one town of New London County. By March, 1911, the writer (7, p. 716) had reports of it in all of the twenty-three towns of Fairfield County, twenty-one in New Haven, fourteen in Litchfield, seven in Hartford, two in Middlesex, three in Tolland, and one each in Windham and New London counties. Out of these seventy-two towns all but seven were west of the Connecticut River. In November, 1911 (11), it was reported in 121 towns of the state, and in February, 1912 (12), it had been found in 164 out of 168 towns of the state. Since that time it has been reported in the remaining four.

We have no doubt that a careful examination would have revealed the blight's presence in many of these towns much earlier than it was first reported. There is no question, however, that it was much more conspicuous in Fairfield and New Haven counties at first than elsewhere, and that to-day it is much more prevalent west than east of the Connecticut River. This is probably due to the fact that in the western part of the state chestnut is more abundant than in the eastern half, and also to the fact that the disease started earliest in the southeastern part of the state. We doubt very much, however, if it has spread from a single infected locality in Fairfield County through all the rest of the state, but hold rather to the idea that it was present in a very inconspicuous way in a number of localities scattered over the state, and has spread from these. See Plate XXI.

Manner of Distribution. Many persons believe that the chestnut blight started at some one locality in the region of New York City and from there spread to all of the localities where it is now known to occur. Maps issued from time to time by Metcalf and Collins are based on this idea. Williams (54, p. 198) has rather positively stated this in the following quotation: "I would like to ask the gentlemen from around the neighborhood of New York City whether if they had been really active and alert and on the firing line when this thing was discovered in 1904, might they not have accomplished some real thing which would have redounded to the benefit of the other states, as Massachusetts has done in her gypsy moth fight? If instead of sitting down and nursing their hands in idleness, and allowing the scourge to go on, simply because they could not originate sufficient interest in their state, they had gone out and done what they could, this thing would probably not have come upon us."

This view almost of necessity carries with it the additional belief that the chestnut blight is of foreign origin, since if of native origin there is little likelihood that the fungus would have been limited to one locality; whereas if imported, it could have spread from one center or even from a single tree. On the other hand, the writer holds the view, at least tentatively, that the chestnut blight has not spread from a single central locality in New York City, but that at the time of its discovery there in 1904 it occurred in an inconspicuous way in widely scattered spots in several states, and that it has been in these localities for years.

The reasons for this belief are as follows: (1) While originally reported from the New York Zoological Park in 1904, subsequent information has shown that at about that time, or even earlier, in several cases already cited, the disease was present in such widely separated places as Woodbridge, Stamford and Greenwich, Conn.; Huntington, L. I.; Bronx Park, N. Y.; Bergen County, N. J.; Lancaster County, Pa., and Bedford County, Va. (2) Its sudden appearance and quick destruction of the trees where first found (98 per cent. infected by end of 1905, as reported by Merkel) indicate that there was some other factor involved than the spread of a virulent parasitic fungus, since such quick work is without parallel in the history of other fungous diseases of trees, or even with this one in its later history. (3) Recent investigations have shown that the fungus is more likely native than imported, and if native, there is no good reason why it should have been limited to the immediate vicinity of New York City. (4) Our investigations in Connecticut have shown it present in some localities in an inconspicuous way at the base of the trees, as if it were a native instead of an introduced fungus, just as its nearest relative is found to-day in the South. This latter fungus, *Endothia gyrosa*, is so generally distributed in the South that there is no doubt that it has occurred there since Schweinitz's time, and yet no one had, previous to our investigations, reported it on chestnut in that region.

We believe that the chestnut blight fungus existed in the North previous to its outbreak in 1904 as a weak parasite in a number of scattered localities. From these centers it spread with greater or less rapidity according to local conditions. This belief does not in any way contradict the possibility of the disease being carried longer or shorter distances by such agencies as infected nursery stock, birds, etc. Perhaps the strongest evidence against this belief is the fact that the greatest damage has occurred in the vicinity of New York City, and apparently has spread outward with the development of seemingly new infections. This apparent wave of progress, however, is in part due to a corresponding wave of interest on the part of the people to locate a disease so generally discussed. It is quite doubtful whether the disease was observed in most of the localities as soon as it made its appearance there, but rather our experience has been that it was usually discovered in a place when someone became interested enough to search for it.

Hosts, Resistance, etc. While the blight was first found on our native chestnut, *Castanea dentata*, and most of the damage has been done to this species, it was soon determined that other species of Castanea were more or less susceptible to the disease. Murrill (48, p. 27) in 1908 called attention to these hosts, as follows: "It is now certain that the chestnut disease attacks all species of Castanea, both native and cultivated, that occur in this region, namely, *Castanea dentata*, the common native chestnut, *C. crenata*, the Japanese chestnut, and *C. pumila*, the chinquapin, found native from New Jersey to Florida." The European chestnut, *Castanea sativa*, though not mentioned by Murrill, is now known to be about as susceptible to the disease as our native species. At first certain varieties of this, as the Paragon, were thought to be more or less immune, but subsequent observation has not shown any that possessed marked resistance.

Concerning the infection of the Japanese chestnut, Murrill said: "This discovery is especially timely because of the fact that the Japanese chestnut has been under observation elsewhere in the vicinity of affected native trees, and has been considered immune, so that it has been mentioned as a desirable substitute for the native tree in some of our parks." Metcalf also had noticed this apparent resistance of the Japanese chestnut, and published a short bulletin (33) in February, 1908, in which he says: "Observations made by the writer the past year indicate that all varieties and species of the genus Castanea are subject to the disease except the Japanese varieties (*Castanea crenata* Sieb. & Zucc.). All of the latter that have been observed in the field or tested by inoculation have been found immune. This fact can hardly fail to be of fundamental importance to the future of chestnut culture. Although the nuts are distinctly inferior in flavor to the European varieties, such as Paragon, the Japanese is already grown on a large scale as a nut-producing tree. There are, however, many trade varieties of dubious origin. Some of these may prove later to be subject to the disease."

So far as the writer has observed in Connecticut, the Japanese varieties seem to have more or less resistance to the disease, but our experience has not been very extended. We have seen two cases, one in a nursery and another in a private yard, where the Japanese species was directly attacked by the blight, but have examined it in nurseries several times without finding any sign of the disease. We also failed to produce the disease in a Japanese variety in the Station yard, although the bark was inoculated in sixteen different places.

In April, 1910, with the aid of the State Forester, we had set on the hillside, beside a badly diseased patch of chestnut timber on the Whittemore estate in Middlebury, six young trees each of the following varieties: Paragon, Reliance, Early Bon, Japan Mammoth, Late Tamba and Alpha, mostly Japanese varieties. These were planted to see if any would escape the blight. Unfortunately, many of them were killed back to the ground the first summer by drought. On the stems of some there appeared on the exposed southern side sun-scald cankers similar to those described by Powell, but no sign of the blight fungus showed that year. Since then a number of the trees have died from drought, but none have been killed or seriously injured by the blight fungus, though in 1911 a little of the fungus was found on two of the badly injured Japanese Mammoth, and in 1912 on two of the languishing Paragon trees cankers had started. The Paragon, of all the varieties, stood the transplanting and drought conditions the best.

Some years ago, through the work of the late Judge Coe of Meriden, Mr. Hale of Glastonbury, and Dr. Britton of this Station, considerable interest was aroused in the cultivation of chestnuts, especially the large fruiting varieties. While we know of no cultivated orchards that were set out, a number of men grafted these varieties onto the native sprouts and trees. Among these were W. O. Corning of Marbledale, and Mr. John Dickerman of Mount Carmel. Both these gentlemen say their grafted trees have been badly injured by the blight. Mr. Corning writes: "Of my Japanese trees a great many will have to be cut down. At the same ratio of progress, none will be left in three years." And in another letter he states further, in answer to our inquiry: "I bought in New Jersey cions for four kinds, namely, Japanese, Numbo, Ridgely and Paragon, all on chestnut sprouts. I bought at the same time trees from seedlings, but they all died before the blight struck us. I find the Japanese stand so far the best. The Paragon are the poorest, although they have made the best growth and produced the most chestnuts. I find the infection commences about at the juncture of the grafts on the sprouts, and runs up and down, faster up than down."

Dr. Robert T. Morris, of Stamford, has experimented more with different varieties than anyone else in the state, so his statement, following a discussion of a paper by Collins (13, p. 43), is of special interest: "In my own orchards I have twenty-six kinds of chestnuts, and have followed them along for the purpose of determining which ones would resist the blight best. I cut out last year [1910] five thousand old American chestnut trees on my property. There is not a tree in all that part of Connecticut, the vicinity of Stamford, that is not blighted, and very few that are not dead. Now, in the midst of this disaster, what was the behavior of my experimental chestnuts of various kinds? It was this. I had about one thousand Coreans that lived up to five years of age, growing in the midst of blighted chestnuts, and none of these blighted. It occurred to me that it might be well to graft these on the stumps of American chestnuts, because these Coreans resisted the blight. But when I grafted them on the sprouts of American stumps, at least 50 per cent. of the Coreans blighted, showing that the pabulum wanted by the Diaporthe seemed to be furnished by the American chestnut. I had some chestnuts from North Japan that resisted the blight, and yet these grafted on sprouts from American chestnuts blighted. I had some Chinese chestnuts, and none of those have blighted as yet; and in grafting them, two or three have not been blighted. I have perhaps twenty-four chinquapins, both the Western form and the Eastern, and only one branch of one tree has blighted. Of the Southern Japanese chestnuts, very many are blighted. They are not as resistant as the Northern. I have a good many chestnuts of European descent, and among these some resist the blight pretty well; and some of the American progeny, like the Hannum and Ridgely, seem to resist well enough, so that I am grafting these upon many different sprouts."

As interest became aroused, inquiries have been frequently made if other trees than the chestnut, especially oaks, were not attacked by this fungus. For a long time its occurrence was not reported on any other host than Castanea. Even as late as April, 1912, Metcalf (35, p. 223) published the following: "So far as is now known, the bark disease is limited to the members of the genus Castanea. The American chestnut, the chinquapin, and the cultivated varieties of the European chestnut, are all readily subject to the disease. Only the Japanese and some other East Asian varieties appear to have any resistance."

Fulton seems to have been the first to report the chestnut blight on oak, having exhibited cultures in December, 1911, at the Washington meeting of the American Phytopathological Society. In his Harrisburg paper (24, p. 53) he reports finding a fungus on white and black oak in Pennsylvania, and says concerning it: "While it is desirable to carry on further cross inoculation experiments, it seems reasonable to suppose in the light of present evidence that *Diaporthe parasitica* may, under unusual circumstances, establish itself saprophytically on portions of trees outside the genus Castanea, if these portions are already dead. We have found no evidence that the fungus produces in any sense a disease of such trees as the oak."

The writer and Mr. Filley first found the chestnut blight on oak in October, 1912, at Middlebury, Conn., in a badly diseased chestnut grove on the Whittemore estate. Previous search for several years had failed to show it on any of the various species of oak examined. At this place the fungus occurred rather inconspicuously, as follows: (1) On an exposed living root of *Quercus alba* that had been injured in some way; (2) On cut surface of wood of a live stump of *Q. rubra* from which young sprouts were growing; (3) On the dead bark and dead stub of a twig on a recently cut stump of *Q. rubra*. Also, in November of the same year, Mr. Walden, of the entomological department, brought to the writer specimens of white oak from Greenwich, Conn., that had been killed by drought, on which this fungus occurred.

Cultures have been made from all these specimens and from a specimen of black oak, *Quercus velutina,* sent by Detwiler from Pennsylvania, and all have shown the characteristic growth of the blight fungus as distinguished from *Endothia gyrosa,* which also grows on oak in the South. However, in none of the cases so far reported does the fungus seem to have been an aggressive parasite on oak. We doubt very much if it ever will produce any serious trouble, since the oaks are hardier than the chestnuts, and have not been deteriorated through sprout renewal.

DAMAGE AND LOSS ALREADY CAUSED.

Character of Damage. The injury caused by the blight fungus to the wood of the chestnut tree is not considered to be very important. Lumber, poles or ties cut from recently killed trees are not distinguished, as a rule, from those taken from perfectly healthy trees, and no data have yet been produced to show that they are in any way inferior. This is because the fungus limits its attack to the bark, and the superficial layers of sapwood. After the death of the tree, the mycelium does not, apparently, form any progressive decay or deterioration of the wood.

If the blight killed only the old trees ready for marketing the damage would not be very great. Loss arises in part from the irregularity of its attack. Each season some trees die, thereby making cutting and marketing inconvenient. The market is often glutted so that they cannot be disposed of to advantage. Further loss may arise in the deterioration of the dead trees if they are not cut soon after death, through decay started by other fungi and by insect depredations.

The situation in Stamford, Conn., was shown in 1909 by Morris (42), as follows: "Millions of feet of fine chestnut timber, valuable for planking, piles, telegraph poles and cordwood, will be lost within the next two years. Right now the blighted trees are still good for cutting purposes. I tried to dispose of about one thousand chestnut trees, but could not find a purchaser. All my neighbors are in the same predicament. 'No market,' is the regular reply to all my letters asking dealers if they handle wood of any sort. Forty or fifty cords of hard wood were rotting on the ground last autumn because I could not find any one that wanted cordwood that had been split and stacked while clearing part of the property three years ago."

The type of damage so far mentioned, however, is inconspicuous in this state as compared with the loss that occurs through the death of trees which are not yet fit for commercial purposes and can be used only for cordwood. The market for the latter in certain districts is easily satisfied. This means low prices or long storage. The greatest loss is caused where future profits are entirely cut out by the death of half grown trees and sprout growth too small for present use. If the disease progresses in the future as actively as in the past, the prospects of our chestnut forests are very poor indeed. This means serious loss, for the chestnut is one of the most useful forest trees in all parts of the country where it occurs.

Besides the loss from a commercial point of view, there is the damage caused to the shade and ornamental trees, and to groves kept on estates, parks, etc., for aesthetic rather than practical purposes. To estimate the damage here is impossible.

In the United States. Certain writers have attempted to estimate in money value the loss caused by the blight. Just how this loss is estimated is not made very clear. To the writer it seems to be largely guess work. However, it is interesting to note these figures in order to compare them with losses given for other fungous diseases and insects. Murrill (49) in 1908 estimated the damage in and about New York City between five and ten million dollars. Mickleborough (40) about the same time estimated the damage through the country at not less than ten million dollars, while in 1909 he (41, p. 14) wrote: "The damage already done in the states of New York, Pennsylvania and New Jersey, would not be less than twelve million dollars." Metcalf and Collins (38) gave twenty-five million dollars as a conservative estimate of the financial loss to the country up to 1911. Detwiler (19, p. 130) estimates the loss in Pennsylvania alone as ten million dollars, allowing seven million for forest and three million for ornamental trees. The largest estimate that we have seen is that given by Marlatt (31, p. 345), who said in 1911: "It is estimated that the loss in and about the City of New York is now between five and ten million dollars, and the loss throughout the area now infested is fully one hundred million dollars."

In Connecticut. We shall not attempt to give any figures for the loss in Connecticut. To do this, one would have to determine the future value of sprout growth, and with more mature timber, to determine the difference between what one really got out of it and what he would have received if there had been no blight. Some idea of the loss, however, can be gained by an estimate of the chestnut in our forests and the percentage already injured by the blight.

Hawes and Hawley, in their forest survey of Litchfield and New Haven counties, estimate the forest land in Litchfield as 55 per cent., and that in New Haven as 46 per cent., of their area. This gives a total of something over five hundred thousand acres of forest for these two counties. While considerable of this is in brush and some in white pine, by far the most of it is mixed hardwoods, with chestnut forming about 60 per cent. of these in Litchfield and 70 per cent. in New Haven County. Counting in all the forest land, Litchfield probably would run over 45 per cent. chestnut and New Haven over 50 per cent., according to these authors. Probably no other county of the state has proportionately so large a part of its area in forest as Litchfield, according to State Forester Filley, but on the other hand, New London is probably the only one that has a less proportion than New Haven County.

On the whole, it is perhaps safe to estimate 40 per cent. of all the forest land of the state as being chestnut. The census for 1910 gives the lumber cut of chestnut in this state for that year as 58,810,000 feet B. M., or nearly equal to that cut from all other trees. These statements show how extensive the tree is in our forests, and how useful. When we consider that from 5 to 90 per cent. of the chestnuts in different parts of the state have already been attacked by the blight, a clearer idea of the great loss already caused may be gained, especially in Fairfield County, where over large areas there is scarcely a chestnut tree to be found that is not either killed or infected by the blight.

PRESENT SITUATION AND FUTURE PROSPECTS IN CONNECTICUT.

In order to give some idea of the damage already done in different parts of the state, the botanical and forestry departments of the Station, after consideration of all the data available, have made approximate estimates of the percentage of chestnut trees attacked in each of the counties. To gain more immediate information as to the condition in the different counties, the writer recently sent the following letter to about seventy-five men scattered over the state who have been especially interested in the blight and have had a chance to watch local conditions: "In 1911 the blight was more widely reported to us and was apparently more generally conspicuous than in any previous year. What we wish to learn from you is whether it was, where you observed it in 1912, more prominent, less prominent, or just about the same, as in 1911." Information gained by this and other means is given by counties as follows:

Fairfield County. The blight was first found by Mr. Stevens, Jr., of Stamford in the summer of 1907, and reported soon afterward to the Station. From Mr. Hollister's observations at Greenwich, the disease no doubt occurred in the county at least as early as 1905. The injury has been greater here than in any other county, and is apparently now on the decline, since most of the trees have been attacked or killed. The Station estimates 75 to 85 per cent. of the trees already dead or infected. In answer to our letter, three report the blight worse, and four about the same or less conspicuous in 1912 than in 1911.

Mr. F. A. Bartlett of Stamford writes: "The chestnut is practically extinct in Fairfield County." Mr. Joseph Cornwell of Norwalk says: "From my observations the chestnut blight was far more conspicuous in 1912 than in 1911. In 1912 I made a special trip into the woods for the purpose of examining the undergrowth, and found it more affected by the disease than at any earlier period. My observations were made in Wilton, Norwalk, Westport, Ridgefield and Redding."

Dr. R. T. Morris, who owns a farm near Stamford, says: "In the different years since the blight appeared some of my neighbors in the country have stated that they have observed more rapid progress than before, and others have expressed the opinion that we had less blight than before. As a matter of fact, so far as I can judge, there has been pretty steady progress of the blight from the first, and at the present time I do not know of a single unblighted tree in the vicinity of Stamford, Conn., although my men and I have taken long walks for the purpose of finding a resistant tree in order to propagate this tree because of its individual characteristics. A great many thousand trees were examined."

On the other hand, Mr. F. V. Stevens, Jr., of Stamford, writes: "I have found that in this section of the state the blight has been far less prominent than in any year since 1908 on the young sprouts, which are practically the only chestnuts we have." Mr. J. H. Treadwell of Danbury also says: "I would say that in this section dead trees caused by the attack of previous years were more in evidence in 1912 than in 1911. However, it does not appear to me that attacks on healthy trees are quite as prominent in 1912 as in 1911."

New Haven County. This was the second county in the state in which the disease was reported. It was found by the writer in Westville in the spring of 1908. From the observations of Mr. Peck of Woodbridge, already alluded to, there is little doubt that it occurred in places here as early as 1905 or 1906. The damage has been second only to that in Fairfield County. Quite a little of the timber has been cut in recent years for use in brick kilns and brass foundries. This has resulted in considerable young growth, which is always likely to show the disease badly. In most of the forests many of the large trees have also been badly infected or entirely killed. We estimate that 55 to 65 per cent. of the chestnut has already been infected or killed. In answer to our letter, nine stated that they believed the blight was worse in 1912 than in 1911, while seven thought it about the same or even less conspicuous.

Professor R. C. Hawley of the Yale Forest School, who has charge of the New Haven Water Company's forests, writes: "My observations have been principally confined to timber merchantable for cordwood or larger products. On such trees I think the chestnut blight has spread steadily in 1912 both in number of trees which it has attacked and, of course, in progress on trees already attacked. From a practical standpoint I anticipate cutting out all the chestnut now merchantable in the vicinity of New Haven. My general impressions are that the disease is slowly spreading among the trees below cordwood size, although I have not devoted so much time to observing these trees."

Mr. W. M. Shepardson, of Middlebury, who has had considerable experience in cutting out diseased trees on the Whittemore estate, says: "The blight was much worse in 1912 here than in any other year, and, as near as I can estimate, spread as much last year as in all previous years put together, so that in badly infested areas few or no trees are left without disease. In the home woods, round the fireplace and on the hill, where all trees were taken out last winter that we could discern, we found in September 845 trees over one foot in diameter that were much diseased and a great many smaller ones."

Mr. G. H. Bartlett of North Guilford writes: "In the vicinity of North Guilford and North Madison the chestnut blight increased very rapidly in 1912. Young trees seemed to be less able to resist the attack than old and large ones. Present indications are that all chestnut sprouts will soon die. Some old trees seem likely to survive for a time."

Mr. E. C. Warner, of North Haven, says, however: "In regard to the chestnut blight I would say it was very much more prominent in 1911 than in 1912. I think it spread very fast in 1910 and 1911, and not very much in 1912. In some places where we cut the diseased trees, blight did not increase very much, and one piece of sprouts I was through the other day did not seem any worse than last year."

Mr. C. A. Metzger, of Mount Carmel, also writes: "As a whole, the blight seems about the same as last year. It does not seem to have advanced as fast as it has hitherto. On our Mount Carmel farm the number of trees infected this year seems less than the number last year."

Litchfield County. Our first knowledge of the occurrence of the disease in this county was due to specimens sent by W. E. Frost from Bridgewater in January, 1909. The next August Mr. F. V. Stevens, Jr., sent specimens from Harwinton and also reported the disease from near Winsted; and Spaulding (69) found specimens at Bantam in September. In January, 1910, E. M. Stoddard collected specimens at Litchfield, and in March W. O. Corning sent others from Marbledale. So by the beginning of 1910 the disease was certainly well established throughout this county. So far the blight has not caused so much damage as in New Haven County, though in some places it has been very severe. Several of the best observers here seem to have noticed an apparent halt in the progress of the disease the past year, which, if continued for another year, will give hope that the chestnuts may escape the severe injury caused in Fairfield County. We estimate the infected chestnuts to be from 40 to 50 per cent. in this county. Of the reports received, seven indicate an increase of the trouble over 1911, while six say the disease was about the same, or less conspicuous.

J. H. Putnam, of Litchfield, writes: "I do not think that the chestnut blight has spread any worse the past season. Its ravages are more noticeable, as many trees previously attacked but not noticed, are now dead. The pieces where I cleaned it out two years ago do not show much spread since." In a later letter he adds this interesting statement: "We have no large trees killed, but have just cut a large tree seriously injured. The cankers on this showed that the disease had gained two to three inches in 1911, but only one-half to one inch in 1912, and in some places the new bark had held its own. Looking over a block of sprouts some ten years old, I found that where two years ago I had considered them doomed, they were making a splendid fight, and in some cases had apparently entirely overcome the disease."

Donald J. Warner, of Salisbury, takes a similar favorable view, as follows: "I do not think that there were as many trees attacked by the blight in 1912 as in 1911 in this vicinity. On our own property in 1911 we cut several infected patches, and around these patches there were quite a number of trees which died in 1912. Of course it is quite possible that these trees had the disease in 1911 and were missed by the choppers. I did not notice nearly as many new cases as in the previous year."

C. L. Gold, of West Cornwall, expresses the same view: "I have been cutting quite a lot of chestnut timber this last fall and winter, and find considerable evidence of the disease, which did not show much or at all before the tree was cut. However, the general appearance of our forests as we look at them from a distance showed but little signs of it the past season, nothing near as much as in the summer of 1911. It would seem as if the trees already infected would surely die, but from the results of the past season I am not so sure of it."

W. O. Corning, of Marbledale, however, reports a worse condition, as follows: "I sent two men this morning to cut out my next winter's wood, and I found a very bad condition, nine out of ten young trees about thirteen years old infected. I was on the same ground last winter, but I found only half as many diseased as to-day. Of my Japanese trees, a great many of them will have to be cut down, and with the same ratio of progress none will be left in three years."

Ellicott D. Curtis, of Bantam, likewise sees no improvement, as he writes: "In our own woods the blight is much more conspicuous than last year, and is doing much greater damage. Some of the infested woods were thinned last winter, and the diseased wood taken out. This winter the disease is very prominent in these, and it looks as if the chestnut would have to be cut clean. It looks to me as if our chestnuts were completely doomed, although I have not so far been able to find the disease in a small stand of trees about sixty years old."

F. V. Stevens also takes a similar view: "At Torrington the outlook is about as bad as it was here [Stamford] three years ago, i. e., it promises to cause a total loss of all the chestnuts in that vicinity."

Middlesex County. Forester Moss found a single infected tree in the state forest at Portland in March, 1910, and this is the earliest date we have for the disease in this county. Later examination, however, showed this infection to have occurred probably as early as 1906. The disease was seen by the writer at Middlefield and Middletown in March, and at Chatham and East Haddam in July, 1911. The blight as a whole is probably somewhat worse here than in Hartford County, but not so bad as in Litchfield. We estimate 30 to 40 per cent. of the chestnuts infected. Three persons report the disease worse, and three no worse, in 1912 than in 1911.

Mr. J. E. Doane, of Centerbrook, writes: "I find plenty of blight in the chestnuts, more in the young than in the older growth. I find about one-half of the twenty-year-old trees in a tract that I have are either dead or diseased. I do not believe that there is any chestnut about here that has escaped from the blight, and think it has spread more in the last year than any time before." D. Herdman, of the Wadsworth estate of Middletown, also thinks the trouble on the increase, as he says: "There is no doubt in my mind but what the blight is more prominent on this estate in 1912 than it was in 1911."

W. S. Hungerford, of East Haddam, reports an improvement: "I noticed the chestnut blight as being more conspicuous in 1911 with a slight decrease in 1912." Mr. J. C. Reeves, of Portland, says: "I think it showed up more prominently in 1912 in some localities, and not so much in others. On my land it was decidedly worse. Not so much new disease, but the trees showed it more. I think there is a change on the state land where we have cut it out. In some places where we would get a load last year, we did not find a tree with the disease."

Hartford County. The first reports we had of the disease in this county were in the fall of 1910, Forester Filley having collected specimens at Hartland in September, and Spaulding (69) at Windsor, and L. H. Goodrich at Hartford, in October. In March, 1911, the writer found the disease at Granby. At present the disease is perhaps not as bad as in Middlesex County, though in some regions considerable damage has been caused. We estimate 25 to 35 per cent. of the chestnuts infected. Of the letters received from this county, three writers think the disease worse in 1912 than in 1911, and three think it was no worse.

Mr. G. H. Hollister, superintendent of Keney Park, Hartford, writes: "As we made a pretty thorough cutting of the diseased chestnut trees last winter, I have not found the tops of the larger trees so badly infected as last year. I have found a great many trees with one or more branches infected, and more young trees than ever before. Probably many of the older trees have the blight, but it is not easily seen at present. On the whole, I consider the disease more prominent in 1912 than in 1911."

S. W. Eddy, of Avon, says: "I looked over the woods yesterday, and would state that there is much more chestnut blight than last year. It showed up more in the young growth and small trees in the open. In fact, the woods and trees there show many leaves still holding on, and on looking them over, one can find the yellow or orange fruiting pustules."

R. S. Tryon, of Glastonbury, writes: "The blight is generally prevalent here, I should say more prominent in 1912 than in 1911, but growth and spread appears not to have been so rapid.

Have noticed two or three instances where healthy growth appears to be overcoming diseased portions."

F. H. Stadtmueller, of Newington, says: "We have as yet escaped any perceptible invasion of the chestnut blight in this immediate vicinity, consequently can make no comparative statements. Lumbermen of this neighborhood have reported it less prevalent in 1912 than in 1911."

New London County. Hodson (28) in 1908 reported the blight along the Connecticut coast to New London, and about that time or a year later Hazard, a Yale forestry student, reported it present in North Stonington. The first specimens we received from this county were sent from Gales' Ferry by Dr. C. B. Graves in May, and from Lebanon by T. E. Clark, in October, 1911. The disease does not seem so bad in this county as in the preceding, and yet is worse than in the two following counties. We estimate the number of infected trees as between 15 and 25 per cent. Only three answers to our letters were received, of which two said the disease was worse in 1912 than in 1911, and one reported it about the same.

Dr. C. B. Graves, of New London, writes: "I should say the blight was just about the same as to general prevalence, but it is my impression that the proportion of badly infected and dead trees may be somewhat greater." Walter C. Tanner, of Voluntown, says: "Where I noticed this blight in 1912, it was much more conspicuous than in 1911."

Tolland County. The writer saw specimens of the blight at Mansfield in July, 1910; Filley collected specimens at Bolton in November of the same year; and H. Wood sent specimens from Tolland in April, 1911. As yet the blight has done comparatively little harm in this county, less than in any other except perhaps Windham. We estimate the percentage of infected trees to be between 10 and 15 per cent. Of the replies received to our letter four place the disease as more, and three as the same, or less conspicuous in 1912 than in 1911.

E. G. Walker, of Union, writes: "There is very little chestnut blight in Union, and I do not think there was any increase over 1911." George Towne, also of Union, says, however: "More cases of the chestnut blight were observed by me in 1912 than in 1911. There is little doubt that it is spreading in this locality." Harry Wood, of Rockville, also thinks it on the increase: "In answer to your question it is my opinion that the disease around here has steadily increased in the past two years."

George V. Smith, of Willington, says: "The blight is increasing quite rapidly in this town. In 1911 I did not observe more than a few cases. In 1912 I found it in colonies of infection. Some men tell me they are finding it everywhere in chestnut cuttings. Two years ago I did not find a tree on my farms. Now there are many." Professor C. D. Jarvis, of Storrs, writes, however: "Replying to your letter, I would say that in my opinion the chestnut bark disease has not been so conspicuous during the past year. Fewer new infections were discovered, and the spread of the disease seems to have been much slower in the sections where it was present."

Windham County. Former Forester Spring collected the first specimens we had from this county at Windham in September, 1910, while Filley and Stoddard reported it from several towns in the fall of 1911. The last two towns in the state in which we found the blight were in this county. The situation here is about the same as in Tolland County, or perhaps somewhat better, as we estimate only 5 to 10 per cent. of the trees infected. Two reported the disease worse, and four as the same or better in 1912 than in 1911.

Mr. W. H. Hammond, of Hampton, writes: "So far as my observation went on my own farm, I was of the opinion that the blight did not spread last year as much as I expected, but there were many reports of it in new sections of the surrounding towns." C. S. Hyde, of Canterbury, says: "I should say the blight was about the same as in 1911, but if anything not quite so prominent in this section." C. E. Child, of Putnam, says: "Less prominent in 1912." On the other hand, C. A. Tillinghast, of Danielson, writes: "I have found the chestnut blight spreading quite rapidly in this section, much more in 1912 than in 1911."

Future Outlook in the State. If we judge from what the blight has already accomplished in Fairfield and New Haven counties, and what it is now doing in certain parts of Litchfield, Middlesex and Hartford counties, there does not seem to be much hope for those regions where the blight has become firmly established. There are those who believe that the blight is bound to go on in the future just as it has in the past, which means the death of all the chestnuts in the infected regions. On the other hand, there are others, like the writer, who believe that there have been unusual conditions that have favored the rise and spread of the disease so far, and that the crest of this wave of infection is bound to be reached, and a gradual decrease to follow when these conditions are changed.

The blight has become far too prevalent and widespread to show sudden improvement in a single year, yet we believe that a let-up in its destructive spread was shown in the year 1912. In 1911, according to all our information, blight was by far more conspicuous and became more widely distributed than in any previous year. This was a year of serious drought, following several dry years. In the winter and spring of 1912 numerous rains replenished very largely the depleted supply of water in the soil, so that even trees in general that had not suffered seriously from any particular trouble showed decided improvement in foliage and growth. This was especially true of the peach, which is a very good indicator of weather conditions. True, there was a drought period in midsummer in 1912, but this did not affect trees so much as it did the superficially rooted crops.

Now, if weather conditions have had nothing whatever to do with the spread of blight, so far as increased or decreased vigor of the chestnut trees is concerned, then the blight in 1912 should have been far more prominent, destructive, and widespread than in any previous year. Yet, thirty-one out of sixty-four persons answering our letter stated that the blight was no worse, or even apparently better, in 1912 than in 1911. If our observations and those of the persons who corroborate them are true, then there is certainly some hope for the future of the chestnut in Connecticut. Just what percentage of the trees will survive the blight we do not aim to predict, but we certainly do not believe they are all to be exterminated.

RELATION TO CONDITION OF HOST.

General Statement. Some writers believe that the condition of the host has had no influence whatever on the rise and spread of this disease. For instance, Metcalf and Collins (37) in 1910 said: "A debilitated tree is no more subject to attack than a healthy one. * * * Dry weather checks the disease by suppressing spore production. * * * Winter injury is not common over the whole range of the bark disease, but may be locally important in producing lesions through which the parasite enters. Winter injury bears no other relation to the bark disease." Metcalf (35, p. 225) in 1912 said again: "No definite evidence, experimental or otherwise, has been adduced to show that a tree with reduced vitality is more susceptible to infection, or that the disease spreads more rapidly in such a tree than in a perfectly healthy and well nourished tree of either seedling or coppice growth, provided that such reduced vitality does not result in or is not accompanied by bark injury by which spores may gain entrance."

Now, if the condition of the host bears no relation to the rise and spread of the disease, the writer knows of no satisfactory explanation for its sudden and destructive appearance in this country except its importation from some foreign country. The evidence to date, however, is very strongly against the idea that it is an imported pest, as we shall show later. Among the farmers in Connecticut who have been able to watch this disease rather closely there are many who believe that the weakened vitality of the chestnuts has had considerable to do with its development and spread in this state. The writer more than anyone else has advocated this view, and we propose to give here the reasons we have for holding it. Briefly expressed, they are as follows:

The chestnut blight was brought to sudden prominence just after the severe winter of 1903-04, which injured and killed fruit and forest trees in general along the coast and watercourses, of which New York City was the central point. The resulting enfeebled condition of the chestnut enabled the blight, a previously inconspicuous parasite, to spring into sudden prominence on these trees and to gain credit for the death of others which had been largely or entirely due to winter injury. Since then we have had one or two severe winters, and more especially several dry summers, that have injured not only the chestnut, but other forest trees over an extended area. Due to its successful attack on the weakened trees, the blight fungus has perhaps acquired an added virulence that has enabled it to attack apparently healthy trees, especially those of sprout renewal. The enfeebled condition of the chestnut trees and their consequent susceptibility to the blight may possibly be related to some lessened chemical activity in the bark and newly-formed wood, such as the production of tannic acid, for instance. If so, then when this has returned to its normal production through favorable weather conditions, the blight should gradually become correspondingly less aggressive. Under the following heads we shall take up more in detail our ideas of the relationship between weakened vitality of the chestnut and consequent susceptibility to the blight.

Winter Injury. We have in a previous Station Report (6) called attention to the results of winter injury on fruit and other trees in Connecticut. We shall attempt here to show also that these conditions were not confined to this state. In December, 1902, following a very open fall, the temperature suddenly fell below zero, with the result that many trees, especially young fruit trees which had not properly matured their wood, were severely injured or killed outright. The following winter of 1903-04 was so unusually severe that thousands of fruit trees in Connecticut, especially those situated in the valleys and on the lower slopes, were killed, and others so severely injured as to develop physiological troubles for some time afterward. The injuries caused by these two winters were most noticeable in the region along the Sound, in the valleys or on the lower hill slopes, and along the river courses, regions in which the chestnut blight afterward first appeared, and in which it has caused the most damage. The winters of 1906-07 and 1907-08 also caused considerable winter injury.

Although we did not at the time directly study the effect on the forest trees of these winters, especially that of 1903-04, which was the most severe, we do know from subsequent observations that many trees were injured. In the summer of 1904 we examined a young fruit orchard, at Stamford, whose wood had been largely killed by winter injury; and two or three years later in examining chestnuts from this region, where the blight has been the most severe, we could see indications of winter injury to the wood of the chestnut sprouts dating back to the winter of 1903-04. In the winter of 1910, in examining chestnut at Middlebury, where the blight was just coming into prominence, we found quite a number of injured and dead trees with no sign of the blight on them. There were others with the bark killed on the south or southwest exposures, and sound on the northern, as shown in Plate XXIII c by the dark and white wood; and on many of these there were no signs of the blight fungus as yet. There is no doubt that these trees had been injured by an attack of sunscorch winter-injury, complicated probably by summer droughts. That we are not alone in believing that these winters did not confine their injurious effects to Connecticut or to fruit trees, that they may have had some connection with the chestnut blight, and that some persons have attributed their effects to fungous and bacterial troubles in certain cases, we shall attempt to show by the following quotations.

Concerning the injury to fruit trees caused by the severe winter of 1903-04, Waite, of the United States Bureau of Plant Industry (Bull. 51), writes: "The severe cold weather of the past winter, especially the intense cold of January 4th and 5th, resulted in very severe damage by freezing to orchards in New York and New England, especially in the Hudson and Connecticut valleys. The damage was found to be mainly to peach, Japanese plums and pear trees, and the most serious harm was largely confined to the lower levels and pockets."

Eustace, of the Geneva, N. Y., Station (Bull. 269), in his discussion of this winter injury, says: "The winter of 1903-04 was an unusually severe one throughout New York state. In many places the temperature was the lowest on record, and the periods of extreme cold were protracted. As a result the end of the winter found many of the orchards, especially those of peaches and pears, extensively and seriously injured. * * * The damage was greatest in the Hudson River valley, where the cold was most severe, more than forty degrees below zero being reported. * * * At the end of the winter the external appearance of the trees was entirely normal, the bark of the trunk was smooth and of normal color, and the twigs on all parts of the tree were plump and bright. Nothing about the trees looked unusual or wrong, but upon cutting into the trunk anywhere above the snow line, it was found that both bark and wood were discolored for some depth into the trunk. * * * Altitude, air drainage, and condition of the soil had a very important bearing upon the severity of the injury. The advantages of a high altitude were best shown in some of the peach orchards in the Hudson Valley. * * * The dying of the trees (afterwards) at such unusual and irregular times gave rise to much alarm among the fruit growers in some localities. It was feared that a virulent attack of the yellows had broken out, or some new and serious disease had become prevalent."

Whetzel, of the Cornell, N. Y., Station (Bull. 236, p. 133), says concerning a supposed outbreak of the bacterial blight of apple in that state: "Anything that reduces the general vitality of the tree tends to render it more susceptible to attack of the bacteria. I have already referred to the apparent effect of low temperature in relation to this disease in the Hudson River region. A long growing season during 1902, with excessive rain, followed by a sudden and extreme fall of temperature early in December, is referred to by growers in that section as the beginning of the injury to their orchards. The winter that followed was a severe one, with sudden and severe changes of temperature during the early days of the spring of 1903. Many trees failed to leaf out, and large cankers were now observed on limbs and bodies of dead and dying trees. The general conclusion at once prevailed that these dead spots were the direct results of these weather conditions. * * * I am therefore of the opinion that many of the trees in the Hudson River Valley and about Kirkville were cankered prior to the winter of 1902-03. The severe weather no doubt weakened the trees yet free from the disease, thus rendering them more susceptible to attack during the summer of 1903. * * * The winter of 1903-04 was also a severe one, and no doubt added to the sum of the injury already produced. To just what extent the winter injury in this section is responsible for the death of the trees is a question. In certain cases it was very evident that the trees had died from this cause." This statement shows that Whetzel recognized the importance of these winter injuries, though apparently he made a mistake in considering blight the major cause of the trouble.

Stone, of the Massachusetts Station (Report 20, p. 123), also says: "In previous reports attention has been called to some of these troubles, more particularly to the extensive winter killing which caused so much injury during the winter of 1903-04, at which time thousands of trees and shrubs were severely affected, many having been dying slowly ever since. Besides the trees which are dying, there are many others which are in a very much weakened condition. Numerous oaks which were injured four years ago have died during the past three years, and some of these not yet dead are gradually becoming weaker. * * * Mention has previously been made in our reports of the condition of the red maples, many of which are now gradually dying, and the white and rock maples are suffering to a limited extent from the same cause." And in a later Report (23, p. 66) he adds: "The severe winter of 1903-04 was not confined to our state, as its work may be seen throughout the whole northeastern section of the United States, and in many instances large orchards were wiped out entirely."

The so-called pine blight was a trouble very prominent in New England a few years ago, culminating in its damage in 1907. At first some investigators, as well as growers, tried to show that this was a fungous trouble, but the investigations of Stone of Massachusetts, Morse of Maine, and of the writer, proved that it was entirely due to unusual seasonal conditions, prominent among which was winter injury. Concerning this trouble, Stone (Report 22, p. 65) writes: "The present pine blight dates back to the winter of 1902-03, when the conditions were such as to cause much injury to vegetation in general. The following winter, 1903-04, was even more severe in its effects on vegetation, and caused extensive root killing of many trees and shrubs. Pine, as well as other trees, in many cases was killed outright, but the injury to the pine was largely confined to the small roots or those less than three-sixteenths of an inch in diameter." Morse (Forester's Seventh Rept., Me., p. 24) also says: "Practically all of the so-called pine blight in Maine appeared in 1907 and 1908, and was coincident with the most destructive winter injury to fruit trees known in the state in the last hundred years."

In the spring of 1907 a late frost killed the immature leaves of the sycamore over a considerable area, as shown by von Schrenk and the writer. It is at this time of the year that the anthracnose fungus begins to be prominent, and the action of the frost was so similar to that of the fungus that several investigators, who apparently were not acquainted with the result of this frost, later laid the trouble entirely to the fungus.

And this has been the case with a number of investigators who have laid winter-injury troubles largely or entirely to the fungi which later became prominent on the winter-injured tissues. One of the first problems the writer had in Connecticut was to connect, as the cause, a Cytospora fungus found on cankered bark of apple trees. We did not know as much about winter injury then as now, and were using the agent that was most evident at the time of the investigation, which occurred some time after the winter-injured cankers were produced.

As to the relationship of winter injury to the chestnuts themselves, we have this statement by Murrill (45, p. 153), when he first began his investigations: "It is possible that the conspicuous ravages of the disease about New York City are largely due to the severe and prolonged winter of 1903-04, in which many trees of various kinds were killed or injured." Later, Murrill seemed to have given up this idea. Stone (Report 23, p. 57) also writes on this point: "The writer has been informed by one who has had some opportunity to observe this disease, that it appears to be less prevalent on high elevations than in the valleys. * * * It is, however, quite significant that the Connecticut Valley region should possess such a large amount of infection as compared with other sections. We have noticed for some time that there is a difference in the degree of winter killing occurring in valleys and high elevations in this state. By far a greater amount of winter killing of trees occurred in river valleys and on the lower elevations, the Connecticut Valley being especially notable in this respect. It is, moreover, a significant coincidence that the chestnut disease should make its appearance at about the same time that vegetation was so severely injured by the severe cold which occurred during the winter of 1903-04 all over the northeastern part of the United States."

From the preceding discussion we have made it evident that there was a general and severe injury of trees of various kinds, resulting especially from the winters of 1902-03 and 1903-04 in New England and New York. We believe that the same conditions would have been found true for at least New Jersey and eastern Pennsylvania, had observations been made there at that time. This winter injury took severest effect along the

Sound* and its contributory rivers, and was soon followed in all these regions by the outbreak of chestnut blight.

Merkel (32), just about a year after the blight was first noticed by him, states that 98 per cent. of the trees were then affected, and adds: "The disease was noticed with equal frequency upon young specimens in the nursery, upon sprouts that had sprung from stumps of trees cut down the previous year, on young vigorous trees thirty to forty feet high standing in deep, rich soil, and also upon the few survivors of the primeval forest with trunks twelve to fourteen feet in circumference." Such a destructive and indiscriminate attack in a single year is not the history of the blight in the later infected regions. To the writer it leads to but one conclusion, namely, that in those regions where the blight first appeared and was most severe the trees had suffered severely from winter injury, as this is the only agent we know of that acts in such a quick and thorough manner.

Drought Injury. There are a number of observers, like Metcalf and Collins, who claim that lack of moisture as affecting the vigor of the chestnut has nothing whatever to do with the spread of the blight, but that, on the other hand, it should show greater progress in moist seasons, since these favor spore development and infection. This idea is also expressed in the following statement by Murrill (46): "Dry summers and otherwise unfavorable conditions may delay the progress of the disease a few years, but not very long." If the fungus were a strictly parasitic species, the condition of whose host made no difference in its virulence, this would be true. The writer, however, holds that the reverse is really the truth, namely, that drought, by weakening the trees, has greatly increased the spread of the disease, and that moist years, while favoring spore production, increase the resistance of the trees, and thereby really lessen infection.

From 1907 to 1911 Connecticut, at least, had an unusual series of summers, with drought periods that caused serious damage to cultivated crops and forest trees in general. For trees alone, that of 1911 caused the most injury, since it was not only severe in itself, but was a culmination of a period of dry summers. During this dry period blight has been most conspicuous in its development and spread in Connecticut, culminating in 1911 with by far the most frequent complaints of damage and spread to new localities. Its unusual prominence in 1911 was not confined to Connecticut, for according to Rane (57, p. 49), Metcalf wrote him: "During the past summer the disease has spread more than in all its previous history." As we have already stated, the winter and spring of 1912 were so wet that much of the depleted moisture was restored to the soil. As the result, the general aspect of fruit and forest trees, including chestnut, showed great improvement over 1911, and along with this came a more or less apparent let-up in the spread and severity of the blight.

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* Hodson (28) wrote in 1908:—"A favorable feature in the situation is that so far the disease has done most damage in the vicinity of the sea."

The particular situation of the trees, according to our observations, often makes a big difference in the development of this disease. Those on the edge of the forest, specially on the southern exposure, have often showed the disease first and most severely. Isolated clumps of sprouts in the open are very susceptible. Forests that have been opened up by removal of trees, especially if on hillsides with southern exposure, are where we find the blight most prominent. Also we have sometimes found it bad in the lowlands. All these represent conditions where the trees suffer most from lack of moisture under continued severe drought.

We have especially in mind a forest in Middlebury on a hillside with southern exposure where the blight became very prevalent. There the trees unquestionably suffered severely from lack of moisture due to the droughts and the opening up of the forest by the removal of diseased trees. Many of those left finally showed sun-scald cankers with accompanying development of blight, at their base on the southern exposure, while the protected northern sides did not. Young nursery trees on this hillside also developed similar sun-scald cankers the first summer they were set out. While this part of the forest was being severely injured, trees on the northern exposure showed very little of the blight.

This observation agrees with the statement of Ashe (Tenn. Geol. Surv., 10 B, p. 11), who writes: "For many years the chestnut on the lower mountains in the southeastern portion of the state has been dying out a few trees at a time. * * * Trees in the hollows and on cool north slopes and on land where a moderately dense shade and soil cover exist have not been affected. * * * The dying off of the trees is certainly not due to the chestnut bark disease." Local conditions such as outcrop of rocks, depth and character of soil, water table, presence of streams, exposure, etc., are all factors in the regulation of soil moisture,* and are not always easily determined by superficial examination. We do know that the blight often acts quite differently with these conditions varying in the same vicinity.

It is often hard to distinguish drought injury from winter injury, as trees that have suffered from severe droughts without much outward evidence of the trouble often succumb during the following winter, and winter injury is given the entire blame. This was well illustrated after the drought of 1911, by a number of fine large chestnut trees on the Experiment Station grounds. The drought of 1911, following the preceding dry years, was very hard on certain of these trees, as the rock in spots comes very close to the surface. The result was that, following the winter of 1911-12 they were seen to be very badly injured at their base, the dead bark in some cases almost entirely encircling the trees. On one tree this dead bark ran up the side for a considerable distance. A little of the blight fungus showed on these injured areas shortly afterward, but it was entirely a secondary factor.

There can be no question whatever that these droughts have injured various trees; and there is no getting around the fact that the blight has been more prevalent because of these droughts, and seems to have gotten the credit for injury to the chestnuts that is in part due to the droughts. Most persons admit that drought has injured and killed many trees other than the chestnut, yet are reluctant to concede that anything but the blight is responsible for the death of the latter. The injury by drought is well illustrated by the death of trees in

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* We understand that, due to the installation of a large water reservoir in the southwestern part of Long Island, the water table of the surrounding region has been lowered considerably. This in turn has severely affected the forest trees, among which are many chestnuts. The blight is quite bad in this region.

East Rock Park, New Haven. This rock rises to a considerable height above the surrounding country, and the soil in many places is quite shallow, so that the trees have suffered severely from lack of moisture during the dry years. The chestnut has suffered with the other trees, and the blight has developed conspicuously, killing many of them. Superintendent Amrhyn furnishes us with the following list of dead and dying trees that were found in this park in 1910.

"I herewith enclose a list of dead trees found in the East Rock Park forests in an inspection made during the month of August, 1910. You will find the largest percentage of them to be chestnut and hemlock. The first were not all dead, but were severely affected by the blight. The hemlocks are all dead, but a few of them have been in that state for two or three years, while all affected or dead chestnuts were cut down last winter.

Chestnut	1,362	Hickory	75	Beech	15
Hemlock	494	Maples	48	Elm	10
Oaks	271	Walnut	44	Linden	7
Birch	101	Wild cherry	24	Locust	4
Cedar	101	Ash	23	Sassafras	3
Carpinus	84	Pines	17	Apple	2

"I think that a very large percentage of these trees, 2,685, have died on account of the great dryness which has existed for about three years, changing conditions ever so much for the root systems of the trees."

Other investigators have admitted the connection between drought injury and blight infection, or at least the possibility of such connection, as shown by the following quotations:

Stone (Rept. 23, p. 57) says: "Our observations on the effects of meteorological conditions on vegetation, and the unusual opportunities we have had to study shade tree conditions for some years, have brought to our attention the unusually large amount of dead wood found on chestnut trees the past four or five years. From what we have seen of the chestnut during this period, we are of the opinion that it has not been in the best condition during late years, and that the chestnut, like the native white and black oaks, elms, red and rock maples, ash, etc., has been more or less affected by the severe cold and droughts of late years." A year later he writes further (Rept.

24, p. 78): "Like the preceding one, the past summer [1911] has been exceptionally dry, and the heat has been intense at times. This drought, coming as it did after three or four previous dry seasons, has affected vegetation to a considerable extent, and will result in later injury, especially to trees."

Rane (54, p. 152) said: "The disease was worse where thinnings had been made and a few trees allowed to stand because they were not large enough to cut into ties. These forests were unbalanced, and the air and sun allowed to get in. The blight was on the southern side; the cankers showed up largely there, but in the stands where we had normal conditions we found only a diseased tree once in a while."

Rankin (60, p. 47), in speaking of the relation of chestnut blight to drought, says: "Preliminary investigations carried on by the speaker seem to point to the fact that the susceptibility of the chestnut tree to this fungus depends upon drought conditions; that is, a low water content in the tree. * * * If the results of Doctor Moench on the cause of susceptibility and immunity of forest trees to disease should prove true in the case of this disease also, we may hope to be able to control the bark disease in shade, lawn and park trees by keeping up the water content of the tree."

Dr. Caroline Rumbold (63, p. 57) states: "As for water, there is the question, as to whether or not droughts of recent years are partially responsible for the spread of the disease in the chestnut tree. I am now conducting experiments in which chestnut trees are being exposed to infection under varying conditions, from dryness to excessive moisture, both atmospheric and soil. These experiments may also throw some light on the report that the blight spreads rapidly where trees are in a crowded coppice, while trees growing on the ridge of a hill are unaffected."

Fire Injury. Not only the writer, but other members of the Station staff, have repeatedly noticed the blight on trees injured by forest fires. Examination of the region has usually shown that the blight was much worse on the trees within the fire area than on those beyond it. This fungus, in the writer's opinion, has not developed merely because of mechanical injury to the tissues, but rather because of lowered vitality of the inner bark and cambium. S. W. Eddy of Avon, in March, 1912, sent us specimens of the blight, and wrote: "We are enclosing you sample of what we think is the chestnut blight. As about 50 per cent. of the trees that were burned by forest fires last spring are covered with this growth, we desire very much to learn whether or not this is the blight." Mr. Eddy, in February of the following year, reported that he found the fungus abundant on the cut wood and fire-injured trees, but scarce on the perfectly healthy ones.

Others have noticed this relationship of blight to fire injury, as shown by the following quotations. Rane (54, p. 152) says: "There is an unbalanced condition again where forest fires have run through the state year after year, and the trees are abnormal, and only half alive anyway. There you find the disease seems to travel more rapidly than it does where the trees are under normal conditions, and have a forest floor where there is plenty of moisture and the conditions are more favorable." Buttrick, in a paper on the effects of forest fires on the trees (Forestry Quarterly, Vol. 10, No. 2), also remarks: "*Diaporthe parasitica,* chestnut bark fungus, seems to be more abundant and severe on fire-injured trees."

Sprouts versus Seedlings. Much of the chestnut of Connecticut has been cut over two or three times, being renewed by sprout growth. This repeated cutting has occurred not only in Connecticut, and in the greater part of New England, but in the chestnut forests of New Jersey, Delaware, and the eastern parts of New York, Pennsylvania and Maryland. It is generally admitted that this treatment has reduced the vitality of the coppice growth, as shown by the following quotation from R. Zon on the chestnut in southern Maryland (U. S. Dept. Agr. Bur. For. Bull. 53, p. 29): "It must not be forgotten, however, that a chestnut stump cannot go on coppicing forever. With each new generation of sprouts, the stump becomes more and more weakened, and hence gradually loses its capacity to produce healthy and vigorous sprouts. Although it is impossible to state with certainty how many generations of chestnut can be raised from the same stock without impairing the vitality of the sprouts, the effects of repeated and bad coppicing manifest themselves in the increasing number of dying chestnuts all over Maryland. The immediate cause of their death can nearly always be traced to attacks of either insects or fungi, yet the prime reason is their decreased vitality, which makes them easy prey to their natural enemies."

If the chestnut blight has no relation to the age or vigor of the tree, it is certainly a curious coincidence that the blight makes its first appearance and causes its greatest damage in the regions where the chestnut has suffered most from repeated cutting over. This is indicated by the two following statements.

Nellis, of the United States Forest Service, in an unpublished working plan on "Utilization of Blight-killed Chestnut," writes: "It is expected that this study will show that the present range of the chestnut bark disease is in a region of entirely second-growth chestnut, which has been culled of its most valuable timber, where only rough products are now being produced."

Barrus, of New York (54, p. 160), says: "In those sections of New York state where the chestnut disease is present most of the marketable timber has been cut out. Fire has gone through the remainder, and as a result, there is a great majority of the chestnut which is sprout growth of small dimensions. I should estimate that one-fifth of the chestnut is of merchantable size, and perhaps in the districts where the disease is, more than four-fifths is under merchantable size."

It has been our experience that young, especially isolated coppice growth, has suffered first and most severely in Connecticut. We believe that these sprouts are naturally weak and easily killed by drought, etc. On the other hand, very large seedling trees have been the last to go with the blight. We noticed also, in our inoculation work, that it was somewhat easier to infect sprout growth than young seedling trees, and that the cankers on sprouts developed more rapidly.

In June, 1912, we examined a field where the Ansonia Water Company had planted about seven bushels of chestnuts in 1908, in 1909 had set out 6,900 one-year seedlings, and in 1910, 9,875 two-year seedlings. While many of these seedlings had been killed by drought soon after they were set out, as shown by the vacant places, we were able to find only two seedlings that showed any signs of the blight fungus. Yet the woods surrounding these trees were quite badly infected with the blight.

At one of the Connecticut nurseries, however, in September, 1911, we inspected about three hundred five-year-old American seedling chestnuts which had been transplanted when one year old, and found 46 per cent. infected with the blight, which had been present there at least two years, and probably started at the time of transplanting. The roots of these plants, when examined, were in good condition. We had the superintendent cut off all the diseased trees in one row (sixty-nine), and in February, 1913, the sprouts that had come from these showed only one that was plainly infected with blight, although they were exposed to the blight from infected seedlings that had not been removed. The first-year sprouts from old stumps also rarely show infection. According to our infection experiments, it usually takes only a month for the canker to show after inoculation, so these one-year-old sprouts had time to show the disease if they were infected. We believe the old, well-established roots produced unusually vigorous sprouts, which for the time being, at least, escaped infection.

Vitality versus Chemical Activity. We believe that favorable or unfavorable climatic conditions for a plant are recorded through chemical activities concerned with its growth and vigor, and that a lessening of this chemical activity might with some plants be shown by lessened resistance to fungous attack. The following few references show the relationship of environment on chemical activities of certain plants.

Hasselbring (Bot. Gaz. 53, p. 120) says: "It is true, of course, that plants are modified in their fluctuating characteristics by changes in the environment, but so far as experimental evidence shows, such modifications persist only as long as the environment inducing them persists. LeClerc and Leavitt, in their work with wheat, showed that this influence of the environment is exerted also on the chemical composition of plants. When wheat of one variety from one locality was grown in other localities with a widely different environment, the chemical composition of the grain was different in each locality. These differences persisted as long as the wheat was grown in the particular locality, but if at any time seed from one locality was grown in any of the others, the grain took on the composition of the wheat constantly grown in those localities.

Vasey (U. S. Dept. Agr. Rept. 1872, p. 171) mentions a case where the alkaloids of cinchona bark were decreased by unfavorable climatic conditions in the case of plants grown in England as compared with plants grown in Peru. Yet when plants from England were sent to India, their vigor was restored, and an increase of the alkaloids was shown by chemical analysis, especially in the descendants of plants sent there.

McKenney (Science 31, p. 750) writes concerning the blight of Central American bananas: "The juice of diseased plants contains much less tannin than that of the normal plants. * * * It has been proved that the disease is not due to local conditions, such as too wet or too dry soil, etc. Yet some of these conditions may predispose the plants to the disease." He does not say whether the lessened tannic acid is the result of the disease or vice versa.

Tannic Acid and its Relationship to Chestnut Blight. The chestnut as a source of tannin is one of our most important trees. However, it seems that most of this tannin is made from the chestnuts in the South, although they are utilized as far north as Pennsylvania. The reason for this is that the chestnuts in the South furnish a greater percentage of tannin than those in the North. At least one cause for this seems to be that the older the trees the greater the percentage of tannic acid, since the tannin is made from the ground wood and apparently comes largely from the older wood. As a rule, the chestnuts of the South are much older than those of the North, and are more likely to be seedlings. As yet the chestnut blight has not caused much harm in the South. Whether or not the present of more tannic acid in the trees there has any relationship to the absence of the blight is as yet uncertain, but there is a possibility of its having a direct bearing.

In answer to a question regarding variation of tannic acid in chestnut trees, Mr. F. Veitch, of the Leather and Paper Laboratory of the United States Department of Agriculture, writes me as follows: "I have your letter of the 11th inst. asking for the tannin content of chestnut wood. This differs all the way from 2 per cent. to as high as 10 or 12 per cent. in very old, dry chestnut. The chestnut wood used by extract makers probably averages around 6 per cent. of tannin. I can make no more definite statement regarding the tannin content of any particular chestnut than to say that young chestnut as a rule contains the least, while the old chestnut contains the highest percentage of tannin. Only the body and large limbs of the tree without the bark are used in the making of tannin extracts."

W. M. Benson (54, p. 229) makes a statement regarding chestnut trees grown on different soils which, if true, possibly explains why, in very dry years, the trees suffer more from the blight than in wet ones, since there may be some relation between the amount of moisture and lime taken in by the roots and tannin produced in the tree. He says: "The chestnut wood received at the extract factories was at first supposed to be all alike in tannin strength, but costly experience proved that wood from good strong lime shale or limestone lands is far richer in tannin than wood from soils that are rocky, sterile, and contain little lime. The difference is so marked that even the workmen in the leach house at extract plants can tell when wood from a lime shale or limestone region is being leached simply by the unusual increase in the strength of the liquid obtained from such wood. Chemical analyses proved the same thing beyond all question, that in order for chestnut timber to attain its full tannin strength it must grow on limestone or lime shale soil."

The part that tannin plays in the economy of plants is not very definitely known. It has generally been supposed to be largely a waste product, which serves more or less as a protective agent against animal and fungus attack. Some few writers have raised the question whether or not it might serve some use in the physiological activities of the plant, possibly in the way of food.

For instance, Pfeffer (Physiol. of Plants, 1, p. 491-3) says: "Fungi can assimilate many aromatic bodies such as tannin, resorcin, hydroquinone, phloroglucin, etc., but except in the case of quinic acid most of these afford very poor food materials. * * * Tannins, phloroglucin, and apparently all aromatic substances which accumulate to any extent, are contained in solution in the cell sap, so that their presence does not injuriously affect the protoplast. * * * Tannins and glucosides are undoubtedly produced for definite purposes, and are not mere by-products produced under all circumstances. * * * In spite of numerous recent researches, but little is known as to the function of tannin."

Barnes (Textbook of Botany, 1, p. 414) says concerning this subject: "Some substances, including the loose term tannin, are glucosides, and such as can be made to yield glucose by digestion may be considered as plastic substances rather than wastes." Stevens (Plant Anat., p. 205) also states: "Tannins seem to be by-products, set aside in the tannin cells from the general circulation. It is uncertain whether the tannins are ever used to an appreciable extent in nutrition. They seem to be of service, however, in warding off parasites by their aseptic qualities and astringent taste."

Cook (Delaware Agr. Exp. Sta. Bull. 91, p. 59), who studied the effect of tannic acid on different species of fungi in artificial cultures, says in his general summary: "It appears that tannin is an important factor, and that its importance varies in accordance with the other substances with which it is associated in the cells of the host plant. While tannin no doubt serves as a protective agent, its efficiency in this direction will vary somewhat with the character of the other substances within the cell. This may account for the variation in power of resistance between species, varieties, and individual plants. The fact that plants which produce large quantities of tannin are subject to disease is no argument against the preceding. The organism may live in tissues which bear little or no tannin, or which contain other substances that in a measure counteract the influence of the tannin. Furthermore, some species of fungi are much more resistant to tannin than are others, and the species which attack these high tannin-bearing plants no doubt possess this quality."

To the writer it has occurred that possibly tannin may serve as an unusual source of food for certain trees rich in this product under unfavorable conditions for active formation of their normal food supply, such as drought years, and that such a use would lessen the supply of tannin laid down in the annual growth of wood formed in these years. Or possibly if not used for food, these unusual conditions do not favor its normal production. In any case, if tannin content bears a relation to the blight disease, it is not the tannin of the whole tree that counts so much as the tannin of the bark and wood of that year's growth. If it bears any relation to the chemical activity of the tree, we can readily see that it could easily vary from year to year according to external conditions more or less favorable for its production.

In our tannic acid culture work with the true chestnut blight and its close ally, *Endothia gyrosa*, reported in detail later on, we found: (1) Both fungi can use tannic acid, at least in small amounts, as food,—shown by the blackening of media through oxidation, loss of acidity, more luxuriant growth, with a low per cent. of the acid added, than without it, and a slight growth on agar-agar with tannic acid as the available source of food. (2) Higher percentages of tannic acid (four per cent. and above) are detrimental to a vigorous growth of either of these fungi, and finally (10 to 14 per cent.) entirely inhibit their growth. But with the true blight the tolerance is apparently greater by 2 to 4 per cent. than that of the saprophytic *E. gyrosa*. (3) Long-continued cultivation of the parasitic variety in artificial cultures without tannic acid probably lowers its tolerance to the higher percentages of tannic acid. (4) Gradually passing these fungi in cultures from the lower to the higher percentages of tannic acid apparently raises their tolerance to it.

From the results of these cultural experiments and what we have been able to learn about tannic acid in the chestnut, we reason that the true chestnut blight is better able to become an active parasite on chestnut trees than the *Endothia gyrosa*. Any cause that would lower the tannic acid, etc., content of the trees would allow it to develop into a more vigorous parasite, and its gradual tolerance to this higher percentage of tannic acid would give it an added virulence up to a certain extent. With the return of the tannic acid, etc., content of the tree above this limit of tolerance, the fungus would gradually revert to a less virulent and finally to even an inconspicuous parasite.

PREVIOUS CHESTNUT TROUBLES.

Nature of the Troubles. It is well known that in times past the chestnut trees in this country have suffered severely in certain districts, particularly in the South, in some cases being practically exterminated, so that their range is now considerably lessened from what it was originally. Strangely enough, no one has surely accounted for any of these devastations.

Personally we believe that this tree is extremely susceptible to changes in the natural environment, and that such changes, with water playing an important part, have been the chief factors back of the gradual decline of this important forest tree. Other factors, such as forest fires, deterioration through repeated cuttings, insect and fungus attacks, are contributing causes varying in different localities.

The question naturally arises, has the blight fungus had anything to do with these previous troubles of the chestnut? As no one ever made a careful study of them at the time, it is impossible to state whether or not the blight was connected with them. One thing is certain, and that is that the saprophytic *Endothia gyrosa* is so generally scattered over the South to-day that there is no doubt it occurred in the regions where these chestnut troubles existed. It seems almost equally certain that the real chestnut blight does not to-day occur in those regions, or if it does, it is very inconspicuous. This would seem to indicate that if the blight had anything to do with these troubles in the past it was not able afterwards to exist there, but gradually extended northward. When one reads the accounts of the outbreaks, he can easily imagine that the trouble might be due to the blight fungus. We give here, arranged according to the time of their occurrence, some references to these troubles.

1825-45. We quote the following from an article by Mr. Jones of Georgia, which appeared in the American Journal of Science, Vol. 1, p. 450, in 1846: "The present remarks are particularly directed to the death and disappearance of some of our trees and shrubs. The first that I will mention is the *Castanea pumila,* which is a tree from ten to thirty feet in height. In the year 1825, during the months from June to September, I observed this tree dying when in full leaf, and with fruit half matured. I examined numerous individuals, and could find no internal cause for their dying. I at first attributed it to the great fall of rain which took place in the year 1823. During the month of July of that year a considerable quantity of land not subject to overflow was covered with water for some time, and the highest lands were completely saturated. The latter part of 1824 was also very rainy. Knowing that this tree belongs in our highest and dryest soils, I concluded it was owing to a too moist state of the ground, but since that time I am convinced that there must be some other cause, for the tree continues still to die up to the year 1845, and if the disease is not arrested, in a few years I fear it will be entirely exterminated."

1856. Following is a letter from Professor G. W. Hilgard, received October 25, 1909 (similar observations by him have been recorded by Dr. Rumbold in Science, Vol. 34, p. 917): "Your paper on the chestnut disease in New England reminds me of some old observations of mine made in the state of Mississippi in 1856. Traveling in the pine hills of northeastern Mississippi, I noted that of the small percentage of chestnut trees among the pines only a few were living, the great majority, mostly very large, tall trees, dead and decaying. On inquiry of the inhabitants, I found that this deadening had occurred lately, and they were at a loss to account for it. To my question why so many were charred at the base, the reply was that when the boys wanted to make a-fire for nooning, they made it against these trees because they burned easily. The trees had not been killed in that way, but had died 'of their own account.' No other kind of trees seemed to be diseased. It was distinctly a dying off of the chestnut alone, and it extended far into Alabama. It would be interesting to know whether the results of that epidemic have been permanent, or whether a new growth has come since the time I saw it. If the Diaporthe disease existed in Mississippi, the presumption is that it extends or extended all along the western Alleghany slopes, and has perhaps reached the Atlantic Coast only recently."

1856. This note was found in The Horticulturist, 1856, p. 97: "All the chestnut trees throughout Rockingham County, North Carolina, and the surrounding counties have died this season."

1855-75. The following references are taken from an article on Statistics of Forestry in the U. S. Dept. Agr., 1875, p. 262, and are concerning chestnuts in the southern belt: "In several localities chestnut for some undiscovered reason appears to be dying out." Under notes on forestry conditions in Henry County, Va., is the following statement: "Chestnut has been dying out for years, and there are fears that it will become extinct." Concerning Elbert County, Ga., is the following: "The forests are a mixture of almost all kinds, but chestnut during the last twenty years has nearly died out." Under

Carroll County, the same state, is the statement: "The forests contained a large quantity of chestnut, which began to die about ten years ago, and now scarcely a tree is left. Even the bushes are nearly all dead, though no insect or worm or other cause affecting them has been discovered." From Hall County also it is said: "Until within a few years chestnut abounded, but now nearly every tree is dead or dying." And from Walton County: "The chestnut has all died." *

1847-77. Under Diseases of Chestnut, p. 116, A. S. Fuller, in The Nut Culturist, published in 1896, writes: "I have never noticed any special disease among chestnuts, neither do I find any mentioned in European books on forestry. The nearest approach to any such malady being recorded as having appeared in this country, is found in a paragraph in Hough's Report on Forestry, 1877, page 470, where the author copies from Professor W. C. Kerr, state geologist of North Carolina, as follows: 'The chestnut was formerly abundant in the Piedmont region down to the country between the Catawba and Yadkin rivers, but within the last thirty years they have mostly perished. They are now found east of the Blue Ridge only, on higher ridges and spurs of the mountains. They have suffered injury here, and are dying out both here and beyond the Blue Ridge. They are much less fruitful than they were a generation ago, and the crop is much more uncertain.' While there is nothing said about chestnut disease in the paragraph quoted, we only infer that the author intended to convey the idea that the trees were suffering from some endemic malady, although it may have been due to long droughts, insect depredators, or other causes. A few years later Mr. Hough, in his Elements of Forestry, refers to the subject again, and admits that 'the cause of the malady is unknown.' But as the chestnuts continue to come to our market in vast quantities from the Piedmont regions, there must be a goodly number of healthy trees remaining."

1889. On this date, P. H. Mell, in the Ala. Exp. Stat. Bull. 3, p. 16, says: "The trees [chestnut] of this state seem to be subject to a blight, or some destructive disease that is rapidly destroying them. This is particularly true when other trees are cut around them. This subject is worthy of careful investigation, and will be a problem for the experiment station to solve in the future." Recently writing to Professor Mell regarding this trouble, he replied: "In reference to Bulletin 3 of the Alabama Experiment Station in regard to the disease which attacked the chestnut trees in Alabama during 1889, I do not think investigation was ever carefully carried out." Atkinson, former, and Wolf, present botanist, at the Auburn Station are unable to throw any additional light on this trouble.

1894. G. McCarthy, in N. Car. Exp. Stat. Bull. 105, p. 267, says concerning chestnut in this state: "The woodman's axe, casual fires, and the ravages of the root disease, have wrought much havoc with these grand forests."

—*1896.* W. P. Corsa, in Nut Culture in the United States, a special report of the U. S. Dept. Agr., Div. Pom., published in 1896, p. 78, writes: "From causes not well understood, there is a marked decline in the vigor of the chestnut throughout the broad area of territory in the Southern States where the white man found this tree among the most thrifty of the original forests. Down to the first quarter of the present century there seems to have been no mention of a trouble in the chestnuts of that section. Within the memory of residents of the Gulf States the chestnut flourished in all their higher lands. In point of time the trouble seems to have begun in the most southern limit of chestnut growth, and there the destruction has been most complete. It has pushed its encroachments throughout Mississippi, Alabama, Georgia, and South Carolina, and is now reported in the strongholds of chestnut growth in North Carolina, Tennessee and Virginia. Observation of the native chestnut growth of Maryland and Virginia discloses the fact that many trees are dying without apparent cause. In some sections this is attributed to the ravages of insects. In others, to an unknown disease resembling blight. There is need for a more thorough investigation of this subject than has yet been made. No injury to the Japanese or European chestnut planted in this country is yet reported."

—*1901.* Dr. Mohr, in Plant Life of Alabama, published by the U. S. Dept. of Agr., Div. Bot., in 1901, page 61, states: "The chestnut, usually one of the most frequent trees of these forests, is at present rarely found in perfection. The older trees mostly show signs of decay, and the seedlings, as well as the coppice growth proceeding from the stumps, are more or less stunted. It is asserted by the old settlers that this tree is dying out all over the mountainous regions, where at the beginning of the second half of the century it was still abundant and in perfection."

—*1911.* W. W. Ashe, in Chestnut in Tennessee, Tenn. Geol. Surv. Bull. 10 B, p. 11, remarks: "For many years the chestnut in lower mountains in the southeastern portion of the state has been dying out a few trees at a time. * * * The dying off of the trees is certainly not due to the chestnut bark disease, a very destructive malady from Virginia to southern New England, no evidence of which was seen in Tennessee."

—*1912.* Dr. Hopkins (54, p. 180), of the United States Dept. of Agriculture, who has recently been making a study of the relationship of insects to the death of chestnut trees in the South, states: "When we review the history of the extensive dying of chestnut during the past half century in Mississippi, Tennessee, Georgia, South Carolina, North Carolina, and Virginia, it is surprising that there are any living trees left. In fact, there are not many left in some sections of these states, where the tree was abundant and healthy fifty years ago. It appears that there are a number of agencies of destruction other than the new chestnut blight disease, and that these agencies have been in operation in the area affected by the disease as well as in areas where this disease is not known to occur. Therefore, they must be taken into consideration and investigated before the problem of protecting the chestnuts can be solved. There appear to be other diseases, and we know that there are insects which have been directly or indirectly the cause of the death of a large percentage of the chestnuts over extensive areas."

—*1913.* Professor H. R. Fulton, of the Agricultural Experiment Station, West Raleigh, N. C., under date of January 29, 1913, writes: "Throughout the whole Piedmont section of this state, just as in the corresponding section of Virginia and further south, the chestnut trees are in an unthrifty condition. This is probably due to a combination of factors. Changes in soil conditions due to a clearing up of extensive areas probably play a part. Trees are evidently attacked to a considerable extent by borers and other insects. Fire injury has in many instances had something to do with the situation. Our preliminary survey of the field has not disclosed any fungous disease that seems to be importantly connected with the condition of the trees."

NATIVE HOME OF THE FUNGUS.

General Considerations. Previous to the work of Merkel and Murrill, no one had ever, so far as known, collected or described the true chestnut blight fungus. Its sudden and destructive appearance naturally leads to the question,—Where did it come from? Murrill has not tried to solve this problem, although we understand he at first believed it to be a native species. The writer is the only one who, claiming it a native species, has attempted to give definite reasons for the belief, and an explanation of its sudden and aggressive development. Others have come forward with the suggestion that it is an introduced parasite, brought in accidentally, either from Japan or Europe. They have been led to their belief apparently largely because the blight was reported at first from a restricted region around New York City, and has apparently since then spread from this center into the regions in which it is now known. We shall consider in the following paragraphs each of these possible habitats for this fungus.

Japan. Metcalf has suggested most definitely that the fungus originally came from Japan, and Marlatt (31), following this suggestion, gives the blight as one of the most striking examples of "why we need a national law to prevent the importation of insect-infested and diseased plants." Metcalf's (33, p. 4) first statement concerning the native home of this fungus is as follows: "The immunity of the Japanese chestnut, together with the fact that it was first introduced and cultivated on Long Island and in the very locality from which the disease appears to have spread, suggests the interesting hypothesis that the disease was introduced from Japan. So far, however, no facts have been adduced to substantiate this view." Later, Metcalf and Collins (36, p. 46) say: "Investigations are in progress to determine the origin of the bark disease in America, and the details regarding its spread. The theory advanced in the previous publication of this Bureau that the Japanese chestnuts were the original source of infection has been strengthened by many facts. It lacks much of demonstration, however, and is still advanced only tentatively. * * * Chester's Cytospora on a Japanese chestnut noted at Newark, Del., in 1902, may have been the bark disease."

Recently Metcalf (35, p. 222) remarks: "Its origin is unknown, but there is some evidence that it was imported from the Orient." Later, in answer to a direct question as to its origin, he adds (p. 227): "That is exactly what we would like to know more about. The fact that the disease has obviously spread from a center leads me to believe that it is an importation rather than a disease which has developed here. The fact that the locality from which it has spread is the same locality into which the Japanese chestnut was first extensively introduced, that the Japanese and Corean chestnuts are highly resistant, and are the only varieties that are at all resistant, all suggest the hypothesis that the fungus parasite may have come from the Orient. However, the origin of the parasite is not a matter of practical importance, unless it could be shown that the fungus parasite is developing spontaneously in many localities from some native saprophytic form, in which case the difficulties of control would be greatly increased."

In the preceding, Metcalf brings out four points in favor of the Japanese origin of the fungus, as follows: (1) Immunity of Japanese and Corean chestnuts; (2) Outbreak of disease originally in Long Island, where Japanese chestnuts were first imported; (3) Spread of the disease from a single center; (4) Possibility of Chester's Cytospora on Japanese chestnut being the blight fungus. Let us take up these four points for further consideration.

(1) The immunity of Japanese chestnut does not necessarily mean that this fungus occurred on it in Japan, and when brought to America spread to the American chestnut, and, finding it a more favorable host, caused the serious outbreak here, as Metcalf suggests. It may merely mean that the Japanese is a more hardy species. From the statements of Morris (13, p. 43) we take it that this is the case, since it is only the Japanese or Corean varieties from the more northern regions that show this resistance. Recently it has been found that the Japanese chestnut is highly resistant to the black canker, a serious chestnut disease now causing trouble in France. Arguing along Metcalf's theory, one could say that this French fungus was of probable Japanese

origin, which no one claims, so far as we know. Again, neither the chestnut blight fungus nor the closely related *Endothia gyrosa* has ever been reported from Japan, so far as the writer has been able to learn. In order to look into this matter a little more thoroughly, we wrote to three of the leading Japanese mycologists on this point. None of them could give us any information of the occurrence of these fungi there, or of any serious chestnut trouble that could be attributed to them. One of them naïvely answered: "Some botanists in your country seem to entertain the opinion that this chestnut blight fungus is of Japanese origin,—an apparently plausible opinion in accordance with a popular belief in certain quarters of your country that things obnoxious come from the other side of the Pacific. Let us see whether the words of these chestnut prophets prove to be the fact or not."

(2, 3) We have attempted, under the head "Manner of Distribution," to show that this disease did not originate in one locality, where first reported, and that its spread has not been from a single, but from many centers.

(4) Regarding Chester's Cytospora on Japanese chestnut, we can say definitely that this was not the blight fungus. We are indebted to the Delaware Experiment Station for the opportunity of examining the herbarium specimen of this, and we find that it is an entirely different fungus, being similar to a Phoma-like fungus not uncommon on dead and dying chestnut sprouts.

Europe. While Farlow (20, p. 70) was one of the first to call attention to the very close relationship, if not exact identity, of our chestnut blight with *Endothia gyrosa* as found in Europe, he has made no claim that the disease was introduced into this country from Europe. He merely asks, "Is *Diaporthe parasitica*, as at first supposed, really a species new to science? If so, is it a native species which has hitherto escaped the notice of all mycologists, or has it been introduced from some other country?" One can infer from his article, however, that if the fungus was proved to be an imported one he would favor Europe rather than Japan as being its native home.

Shear (65, p. 212), however, comes out with a more definite statement as regards the European origin of the fungus, as follows: "As a result of our studies to date, we are of the opinion that *Diaporthe parasitica* Murr. is the same as *Endothia* *radicalis of* European authors, but not of Schweinitz, and that it was probably introduced into this country from Europe, and has gradually spread from the original points of introduction, its spread being facilitated chiefly by borers or other animal agencies which produced wounds favorable for infection by the fungus."

Shear's reason for supposing that the chestnut blight was imported from Europe was that *Endothia gyrosa* occurred on chestnut there, and he could not distinguish the American chestnut blight from this fungus. He, however, apparently did not know that *E. gyrosa* (*E. radicalis* of some European authors) also occurred on chestnut in this country. Further, he (66) was misled by an incorrectly named culture received from Pantanelli (supposed to be of European origin but later turning out to be the real blight from America) with which he produced the disease in chestnuts.

Pantanelli (53) of Italy, who has recently made a study of the European *Endothia gyrosa* and the American chestnut blight, finds (1) that they are different in many small microscopic characters; (2) that, while *E. gyrosa* varies somewhat in character in Europe, there are no variations that correspond to the chestnut blight type; (3) that the native *E. gyrosa* causes no serious disease in Europe; (4) that the American chestnut blight, when inoculated into chestnut in Italy, produces the disease. Naturally he concludes that our chestnut blight cannot be of European origin.

To the above we might add the fact that European chestnut grown in this country is quite susceptible to the blight, and it would be rather difficult to explain its susceptibility in this country and its immunity to the native fungus there, unless environment really did bear some relationship to susceptibility and immunity of the host, which is denied by Metcalf.

United States. The writer's reasons for believing the chestnut blight is native to this country may be summarized as follows: (1) It has never been found in any other country. (2) It is very closely related to *Endothia gyrosa,* apparently developing from it as a distinct variety, and this species is a native fungus in this country as well as in Europe. (3) The limits of distribution of *E. gyrosa* and the chestnut blight overlap at least in the region covered by Washington, D. C., to southern Pennsylvania, while *E. gyrosa* occurs south of this common area and the chestnut blight north of it. (4) We have previously had serious troubles of chestnut trees in this country, and there seems to have been a continued northward movement of these, culminating in the recent trouble in the northern limit. While the chestnut blight has been definitely connected only with this last trouble, the previous ones have never been really explained. (5) The suddenness, etc., of the recent blight outbreak has been adequately explained by the writer through the unusual environmental conditions that have weakened the chestnuts in the general regions where the outbreak has occurred. (6) The fact that the chestnut blight fungus was never reported before this outbreak is no more difficult to explain than the fact that *E. gyrosa* had never been reported on chestnut in this country until by the writer a year ago, and yet this is a native fungus widely distributed on chestnut in the South, and has been known there on other hosts since 1822, when described by Schweinitz. They both were, in fact, merely overlooked on the chestnut. (7) Our cultures of *E. gyrosa* vary more from their normal type than do those of the variety *parasitica*, and some of these have varied somewhat toward the variety *parasitica* type. This, however, may have been due in part to bacterial contamination, etc.

AMERICAN SPECIES OF ENDOTHIA.

Various Species. It has been agreed among those who have recently studied the blight fungus from a systematic standpoint that it belongs under the genus Endothia rather than under Diaporthe, and is at least very closely related to the American-European species *Endothia gyrosa.* So far there have been described under the genus Endothia comparatively few species. Fries, who founded this genus, apparently considered *Sphaeria gyrosa* as the type, but did not give a very complete generic description. As understood to-day, however, Endothia has quite distinct generic characters. Of the species other than *Endothia gyrosa* and the chestnut blight, there have been found in North America *Endothia Parryi* (Farl.) Cke., on Agave sp., *Endothia longirostrata* Earle, on the bark of fallen trees from Porto Rico, and *Endothia radicalis* (Schw.) Farl., on Quercus, etc., chiefly from the Southern states.

Besides these, there is a somewhat similar appearing fungus recently described, by H. & P. Sydow. (Ann. Myc. 10, p. 82) on Quercus from Colorado, as *Calopactis singularis*. It is a semi-parasitic species, apparently, whose generic position is somewhat doubtful, as the asco-stage has not been found. It has been known in this country for some time, and by some botanists has been placed under *Endothia gyrosa*, since the fruiting pustules and the Cytospora spores of the two are very similar. However, the fruiting pustules are larger, deeper crimson in color, and in maturity more powdery. We have it in culture from a specimen recently sent by Bethel from Colorado, and while it grows something like *E. gyrosa*, it does not form any distinct conidial fruiting pustules on media tried so far, and in manner of growth and color of mycelium resembles more nearly the cultures of *E. radicalis*.

Of the species mentioned, we need to consider in connection with the blight fungus only *Endothia gyrosa*, already discussed somewhat, and *Endothia radicalis*, since these three in their Cytospora stage are so similar in appearance that they cannot be distinguished by the naked eye, and all have at least the oak as a common host. As *E. radicalis* is most sharply set off from the other two, we will discuss it first.

Endothia radicalis. While the fruiting pustules of this species are not different from the other two, when we examine the asco-stage under the microscope it is very easily distinguished by the much narrower spores. These ascospores vary from linear to linear-oblong, are occasionally slightly curved, are apparently single-celled, though possibly they may in some cases develop an indistinct septum, and are 6-10 μ, rarely 12 μ, long by 1-2 μ wide. We have never seen spores which grade into those of the other two species described here, so it is apparently quite a distinct species. See Plate XXVIII a, d.

It seems to be largely southern, having been found in its asco-stage in Louisiana, Mississippi, Georgia, Alabama, Florida and North and South Carolina. However, there are specimens in various herbaria from much further north, showing only the conidial stage, that apparently belong to this species. One specimen found in Connecticut has been under observation on roots of an oak tree for over a year, and though in a vigorous growing condition, has made no attempt to form the asco-stage.

Artificial cultures, however, show that it is this species. This means, apparently, that the species does not form its asco-stage readily in the North. It has not been reported as yet from Europe or elsewhere. While it seems to be largely saprophytic, we recently received from Wolf, of Auburn, Ala., an elegant specimen on the live trunk of water oak, that shows it possesses parasitic tendencies. Plate XXIV e.

So far this fungus has been reported on several species of Quercus and on *Liquidambar Styraciflua.* Earle and Underwood collected what may be this species on Vitis. Schweinitz described his *Sphaeria radicalis* as rare on roots of Fagus, though on the envelope containing the original specimen he states it is on the roots of Quercus, which seems more likely. However, we have recently received ample specimens collected by Hall, at Clemson College, S. C., on the roots and bark of Fagus, which proves that this is to-day a host of the fungus further south, and so it may have been at Salem, N. C., as stated by Schweinitz.

In cultures it forms a rather abundant aerial mycelium, something like *Endothia gyrosa,* but differs in that this is much more fluffy in character, and does not usually form fruiting pustules on the surface of the agar, Plate XXVI 7596. The conidial spores are produced in rather indefinite spots on the mycelium, and are very similar in appearance to those of the other two species, Plate XXVIII g-i. The mycelium lacks the *bright* orange color that is characteristic of *Endothia gyrosa* on most media. At first it is white, and often remains partly uncolored, but finally has considerable *brownish* orange color, especially next the glass on the surface of the agar. In Petrie dishes the mycelium often forms a somewhat annulated development by the newer growth being less elevated than the older. We have cultures of it from *Liquidambar Stryraciflua* and *Quercus nigra,* from Alabama; *Fagus ferruginea, Quercus coccinea,* and Quercus sp., from South Carolina; *Quercus falcata,* from North Carolina; and *Quercus rubra,* from Connecticut.

There is considerable doubt as to who first described this species, since it has usually been confused with the next. Shear (64) speaks of it as *Endothia radicalis* (Schw.), thus identifying it with *Sphaeria radicalis* of Schweinitz; and the Andersons seem to think that Shear definitely proved it to be identical with that species. No Schweinitzian specimens of *Sphaeria radicalis* in this country, however, have yet been found which have ascospores, though there is no doubt from the specimen in the conidial stage in the Schweinitzian collection in the Philadelphia Academy of Science that *S. radicalis* refers either to this species or to *E. gyrosa*. As Shear had opportunity to see certain specimens of *S. radicalis* and *S. gyrosa* sent by Schweinitz to European botanists, the writer thought he had found the ascospores of *S. radicalis* to be linear. Recently writing Shear on this point, we received the following letter:

"The specimens on oak roots collected by Hall in South Carolina which I identified as the typical *S. radicalis* of Schweinitz were, according to my recollection, compared with authentic specimens of Schweinitz from either Schweinitz's herbarium or Curtis' herbarium at Harvard. This identification was made last winter before my trip to Europe. I have been going over carefully all our slides and specimens to locate the material on which this identification was based. I regret to say that thus far I have been unable to find it. In this same connection I have examined very carefully the material from the Kew herbarium, which consists of an autograph specimen collected by Schweinitz, presumably at Salem, N. C., and sent by him to Hooker. I am surprised to find, on examination, that this specimen, though it shows considerable variation in ascospore measurements, does not appear to agree with the long, slender form of ascospores found in the specimen on oak roots which I sent you from Hall's collection at Clemson College, S. C. The measurements, as they have just been made from a slide from the Kew specimen, range mostly from 6.3-8.6 by 2.8-3.6 μ. I think it is still possible that all sorts of intermediate forms and sizes of spores will be found in the South connecting the long and short-spored specimens."

Writing to the Kew herbarium for information concerning the specimen mentioned by Shear, which seems to be the only Schweinitzian ascospore specimen of *Sphaeria radicalis* yet reported, we received a letter from Assistant Director Hill, with the following notes made by E. M. Wakefield: "The specimen referred to by Shear appears to be one which bears simply a pasted-on rough paper label with the name '*Sphaeria radicalis*' in ink. On the authority of Mr. C. G. Lloyd, who is working here at present, the handwriting is that of Schwaegrichen, and the specimen is an authentic Schweinitzian one. It is probably one of a set sent to Hooker, though there is nothing on the label to indicate that this was the case. There is a pencil reference in another handwriting (apparently Berkeley's) to 'Fr El. 2 p. 73. Versatiles.' Some ascospores have been found in this specimen from which the accompanying drawing has been made. They measure 5-7.5 x 2-3 μ (average size about 7 x 2 μ). The spores are usually one-septate. The septa are indistinct unless stained."

From Shear's and Wakefield's measurements of the spores, one can readily see that the specimen in the Kew herbarium labeled *Sphaeria radicalis* is not the species we are considering here under that name, but really the next species, *Endothia gyrosa*. In a previous publication (9) we stated our belief that Schweinitz's *S. radicalis* and *S. gyrosa* represented either the two distinct species of Endothia that we now find in the southern United States or else the conidial and the asco-stage of only one of them, most likely *S. gyrosa*. This Kew specimen points to the latter of these two conclusions. It has also been the opinion of certain European botanists that these two species of Schweinitz were merely synonyms, and identical with the form found in Europe, which we call *Endothia gyrosa*.

Ellis (N. Am. Pyren. p. 552) in his description included both of these species (his spore measurements relating to one and his drawings to the other), though most of the specimens he referred to are those with linear spores. Farlow (20) was the first to really point out the two as distinct species, and because of this we (9) previously referred to the linear-spored form as *Endothia radicalis* (Schw.) Farl., though Farlow never definitely used this combination for the fungus. While at present it seems somewhat doubtful if Schweinitz's *Sphaeria radicalis* really relates to this fungus, we shall retain this combination, hoping for further light on the subject through future investigation. On the other hand, there is little if any doubt that Schweinitz's *Peziza cinnabarina* does relate to its conidial stage, since it is identical, and has Liquidambar for a host, a host upon which *E. gyrosa* has not yet been reported. The nomenclature already used for this fungus by different writers is as follows:

Endothia radicalis (Schw.?) Farl.

Peziza flammea Schw. (not Alb. & Schw.) in Fung. Car. Sup. n. 1193. 1822.

Peziza cinnabarina Schw. N. A. Fung. n. 840. 1831.

? *Sphaeria radicalis* Schw. N. A. Fung. n. 1269. 1831.

Sphaeria gyrosa Schw., Ravenel in Fung. Car. n. 49. 1852.

Lachnella cinnabarina Sacc. Syll. Fung. 8: 399. 1889.

Endothia gyrosa (Schw.), Ell. & Ev. in N. A. Pyren.: 552. 1892. *p. p.*

Endothia radicalis (Schw.), Shear in Phytop. 2: 88. Ap. 1912.

Endothia radicalis (Schw.) Fr., Andersons in Phytop. 2: 210. O. 1912.

Endothia radicalis (Schw.) Farl., Clinton in Science 36: 910. D. 1912.

Endothia gyrosa. We have examined ascospore specimens of this species on *Castanea dentata* from several southern states; on *Castanea sativa* from two sources in Italy; on *Quercus alba, Q. velutina,* Quercus sps. from several localities in America; on Quercus sp. from Italy; on *Carpinus Betulus* from Tiflis, Russia; on Carpinus sp. from Italy. So far as we can tell from a microscopic examination, these all belong to the same species, though there is some slight variation of the ascospores in the different specimens. These ascospores vary from elliptical oblong to narrowly oval, often tapering to one or both ends, have an evident septum, and are chiefly 6-9 μ long x 2-3.5 μ wide. They are therefore quite distinct from those of the preceding species (see Plate XXVIII b, e). Saccardo gives Aesculus, Alnus, Corylus, Fagus, Juglans and Ulmus as reported hosts for this species, with a distribution including North America, Europe, Ceylon, and New Zealand. But a careful comparative examination would be necessary to state positively that these all relate to the same fungus.

We have made cultures of this fungus from many different sources on chestnut and oak from the South, and on chestnut from Italy. See Plate XXVI 7590, 7584. While these show some slight variations, they have a general agreement, but differ decidedly from all cultures of the true chestnut blight. We have made inoculation tests, and have found the fungus to be a saprophyte, but with weak parasitic tendencies. Both the cultures and the inoculations we will discuss later in connection with those of the true chestnut blight.

From the name usually applied, *Endothia gyrosa* (Schw.) Fr., it is seen that Schweinitz's *Sphaeria gyrosa* is considered the original type of the species. Schweinitz, in his Fung. Car. Sup., 1822, described this from Salem, N. C., on decaying bark of knots and also living bark of Fagus and Juglans. There is to-day some doubt about his correct determination of these hosts. He sent specimens to Fries, who also described it in his Syst. Myc. 2, p. 419, in 1823; and in his Elench. Fung. 2, p. 84, in 1828, he compares it with specimens received from Southern Europe. In 1845, Fries, in Summ. Veg. Scand., created a new genus, Endothia, citing *S. gyrosa* of Schweinitz as the type, and ever since then European botanists have considered *Endothia gyrosa* of Europe to be the same fungus as *Sphaeria gyrosa,* described by Schweinitz from America. Some few have given Fuckel as a second authority for the name, *E. gyrosa* (Schw.) Fckl., since that author in his Sym. Myc. p. 226, in 1869, indicated that he was the first to place this species under this genus, evidently considering that Fries had not properly placed it there, since he did not really write the combination *Endothia gyrosa.*

From the descriptions of both Schweinitz and Fries, it looks as if Schweinitz collected only the Cytospora stage of this fungus. This is further borne out by the fact that Schweinitzian specimens examined by Farlow and Shear in this country and Europe show only that stage. The original specimen of Schweinitz at the Philadelphia Academy of Science has been lost or misplaced, and in the original envelope is an entirely different fungus, a Nectria sent by Torrey from New England, which Schweinitz years afterwards apparently mistook to be this species. The writer (10) found a misplaced specimen (in another collection made by Schweinitz, now at the Philadelphia Academy of Science), which probably is his original type, but this also shows only the conidial stage. In the Curtis collection at Harvard, however, there is a Schweinitzian specimen of *S. gyrosa* which, while in the conidial stage, has a drawing on the envelope by Curtis of ascospores which are like those of this species rather than linear, like those of *E. radicalis*, already discussed.

Both Schweinitz and Fries always considered *Sphaeria gyrosa* and *S. radicalis* as distinct species, but of very similar appearance, and Fries, when he formed the genus Endothia, did not include the latter under it. Botanists in their day, however, did not make very careful microscopic examinations. De Notaris, in Sfer. Ital. 1^1, p. 91, in 1863, seems to have been the first to place *S. radicalis* under the genus Endothia, and Tulasne, in Sel. Fung. Carp. 2, p. 87 and p. 298, the same year, was apparently the first to consider the *S. gyrosa* and *S. radicalis* as one species, which he called *Melogramma gyrosa*. Fuckel also, in 1869, treated them as one species, and since that time European botanists have generally considered them as a single species, using sometimes *E. gyrosa* and sometimes *E. radicalis* as a specific name. In view of the information already given in Shear's letter, we are inclined to believe that this interpretation is correct, and that *S. gyrosa* is merely the conidial stage, as first suggested by Winter in Rab. Krypt. Fl. 1^2, p. 804.

A considerable number of names have been applied in Europe to *Endothia gyrosa*, but it is rather difficult to determine whether all of these apply to the fungus under discussion. For instance, Streinz, in Nom. Fung., p. 545, in 1862, under *S. gyrosa*, gives *S. fluens* Sow. as a synonym, and under *S. radicalis*, p. 559, gives *S. tuberculariae* Rud. as another. Shear has examined the Sowerby specimen, and he says: "There is little doubt that *Sphaeria fluens* Sow., described and figured by Sowerby in the supplement of his English Fungi, 1814, Plate 420, published as part of Plate 438, from a collection by Charles Lyall, in the New Forest of southern England, is the pycnidial condition of *Endothia radicalis* De Not." If this is true, then it must be an extremely rare fungus in England, since in answer to a letter to the Kew herbarium we received the reply that "*Endothia gyrosa* is very rare in Britain, if it really occurs." From Sowerby's description, one cannot be sure if it relates to this or some other fungus. Mr. Wakefield of Kew writes concerning our inquiry as to the host: "It is not possible to say with certainty what is the host of Sowerby's *Sphaeria fluens*. The specimen is very small, and no note is attached to it." We do not believe that this English specimen has as yet been definitely identified as the same thing as *Endothia gyrosa.* We give below the nomenclature which probably applies to the fungus in question.

Endothia gyrosa (Schw.) Fr.
? Sphaeria fluens Sow. Eng. Fung. *t. 438* (with *t. 420*). 1809?
Sphaeria gyrosa Schw.* Fung. Car. Sup. n. 24. 1822.
Sphaeria Tuberculariae, Rudolphi in Linnaea 4: 393. 1829.
? Sphaeria radicalis Schw.† N. A. Fung. n. 1269. 1831.
Endothia gyrosa Fr. Summ. Veg. Scand.: 385. 1845.
Diatrype radicalis Mont. Ann. Sci. Nat. Bot. 3: 123. 1855.
Valsa radicalis Ces. & De Not. Schem. Sfer. Ital.: 33. 1863.
Endothia radicalis De Not. Sfer. Ital. 1^1: 9. 1863.
Melogramma gyrosum Tul. Sel. Fung. Carp. 2: 87. 1863.
Nectria gyrosa B. & Br.‡ Journ. Linn. Soc. Bot. 15: 86. 1877.
Chryphonectria gyrosa Sacc.‡ Syll. Fung. 17: 784. 1905.
Endothiella gyrosa Sacc. Ann. Myc. 4: 273. 1906.
Endothia virginiana Anders. Phytop. 2: 261. D. 1912.

Endothia gyrosa var. *parasitica.* We have previously spoken of the very close connection of *Endothia gyrosa* to the chestnut blight, and have shown that Farlow and Shear in this country, and von Höhnel, Saccardo and Rehm in Europe recognize them morphologically as a single species. Recently we sent ascospore specimens of the two on chestnuts from this country to these European botanists for further comparison, and their opinion as to the relationship. They still maintained that the American chestnut blight was not different specifically from *E. gyrosa* as found in Europe and America, but was merely a more luxuriant strain that had so developed through its parasitic habit. It is to be remembered, however, that all of the above investigators, except Shear, have based their conclusions merely on microscopic examination, since they have not had opportunity to study the situation in the field, and have not made cultures or inoculation experiments. On the other hand, it is to be taken into consideration that they are all botanists with a very extended experience in the systematic study of fungi.

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* The conidial stage of the fungus described.

† The asco-stage of the fungus described. Fries apparently published his description before Schweinitz.

‡ This fungus, according to von Höhnel (29).

The Andersons have taken the other extreme, namely, that the chestnut blight, which they call *Endothia parasitica,* is entirely a distinct species from *E. gyrosa,* which they call *E. virginiana.* Their conclusion is evidently based on the parasitic habit of the former as compared with the saprophytic habit of the latter, the difference between the two in artificial cultures, and the slight morphological differences in their ascospores. Pantanelli (53) in his recent article might be considered as agreeing with the Andersons in considering the two as distinct species, since in his conclusions he says: "The *Diaporthe parasitica* Murrill is an Endothia, closely related to, but not like, the *E. radicalis* (Schw.) Fr. Hence it is opportune to distinguish it as *E. parasitica* (Murr.) Anderson." However, Pantanelli was trying to show that these two were not entirely identical, and was not really concerned in their exact relationship, since he stated earlier in a footnote: "Recently, November 28, 1912, Professor P. A. Saccardo has communicated to me that he regards *E. parasitica* as a race of *E. radicalis* modified by parasitism. One may then consider whether it is a species or a distinct variety, but from the viewpoint of the pathologist it makes no difference."

The writer, after a careful study of the blight fungus and of *Endothia gyrosa,* microscopically, in cultures, and in inoculation experiments, with an opportunity to examine both in the field, and also specimens of *E. gyrosa* on several hosts from Europe, has come to the conclusion that these two forms are too closely related to be considered distinct species. On the other hand, they are certainly distinguished through slight morphological differences in their ascospores, marked and constant cultural differences, and the apparently great difference in their parasitic tendencies. These differences lead us to consider the blight fungus as a distinct variety of *E. gyrosa,* which is evidently the older form from which the blight fungus has been derived.

As previously stated, neither *Endothia radicalis* nor *E. gyrosa* and its variety *parasitica* differ enough in their fruiting pustules or conidial spores to present any very special distinguishing characters. The ascospores of *E. radicalis,* however, differ from both the latter by being decidedly narrower (see Plate XXVIII a-c). The ascospores of *E. gyrosa* are much nearer to the type of the true blight fungus than to *E. radicalis,* although they are somewhat intermediate. In general we can describe the ascospores of *E. radicalis* as linear, those of *E. gyrosa* as narrowly oval, and those of *E. gyrosa* var. *parasitica* as broadly oval. Usually one finds some spores of *E. gyrosa* and the variety *parasitica* that cannot be distinguished in size or shape. However, upon examining many from a specimen, one can tell which it is, as *E. gyrosa* has some spores that are narrower, and variety *parasitica* some that are broader, than any found in the other form.

Measurements were made of one hundred ascospores of *Endothia gyrosa* var. *parasitica* from ten different chestnut trees from various localities, and these varied from 6 to 10 μ long x 2.75 to 5 μ wide, while the average was 7.45 μ long x 3.2 μ wide. Similarly, one hundred ascospores of *E. gyrosa* from ten different chestnut trees from various localities, including one from Europe, varied from 6 to 9 μ long x 2 to 3.5 μ wide, the average being 7.205 μ long x 2.695 μ wide. To have maintained the same proportion in width as in length to var. *parasitica,* these spores should have been 3.095 μ wide. Likewise, sixty ascospores of *E. gyrosa* on six oak trees from different localities, one from Europe, showed a variation of 6-9 μ x 2-3.25 μ, averaging 7.099 μ x 2.733 μ. Also forty ascospores of *E. gyrosa* on Carpinus from two sources in Europe varied from 5 to 10 μ x 2.25-3.5 μ, averaging 7.58 μ x 2.8 μ.

These measurements show that there is a rather constant difference in the width of the ascospores of *Endothia gyrosa* and *E. gyrosa* var. *parasitica,* no matter what the host or the locality from which they came, and if we also take into consideration the differences in artificial cultures and in the parasitic habits of the two, there seems no reason for not considering the blight fungus at least a distinct variety. The nomenclature of this variety is as follows:

Endothia gyrosa var. **parasitica** (Murr.) Clint.
Diaporthe parasitica Murr. Torreya **6**: 189. 1906.
Valsonectria parasitica Rehm, Ann. Myc. **5**: 210. 1907.
Endothia parasitica Anders. Phytop. **2**: 262. D. 1912.
Endothia gyrosa var. *parasitica* Clint. Science **34**: 913. 27 D. 1912.

ARTIFICIAL CULTURES.

Source of Cultures, etc. We have had cultures of *Endothia gyrosa* under observation for more than a year, and of the variety *parasitica* for more than four years. These have been obtained from many different localities, and from both chestnut and oak in each case. For example, we now have eighteen different cultures of the chestnut blight obtained from localities in Massachusetts, Connecticut, New York, Pennsylvania, and the District of Columbia; and besides these we have had others from time to time. We have five cultures of the blight originally obtained from three different species of oak, from two regions in Connecticut and one in Pennsylvania. Of *E. gyrosa* on chestnut we have fifteen cultures from eight different regions in Pennsylvania, Virginia, Tennessee, and North Carolina, and one from Europe; and ten cultures from three species of oak from five different regions in the District of Columbia, Virginia, and North Carolina.

We have grown many hundreds of these cultures on a variety of media in test tubes and Petrie dishes, though for most purposes tubes of potato- or oat-juice agar have proved the most satisfactory. From this extended experience we have been able to judge accurately as to purity of the cultures, constancy of their cultural characteristics, and differences that distinguish the variety from the species. Ordinarily the conidial spores of each have regularly appeared in these cultures, but in varying degree. In no case has the asco-stage of either been produced. Its production has seemed more likely to occur in the case of *Endothia gyrosa,* since in some cultures the conidial fruiting stage appeared as rather large, distinct, elevated pustules; but these have never shown any signs of ascospore formation. We have made some attempts, by special media or treatment, to induce the asco-stage to appear in these pustules, but without success.

Endothia gyrosa versus var. parasitica. The following characteristic differences were noted in special test tube cultures made at the same time on potato-, Lima bean-, and oat-juice agar, from twenty-five sources of *Endothia gyrosa* and ten sources of var. *parasitica.* In general, it may be stated that the potato-juice agar favors spore production for both, while the oat-juice agar favors a vigorous aerial mycelial development, especially for *E. gyrosa*. The bean-juice agar is somewhat intermediate in both respects. On any of these media, *E. gyrosa* is much less likely to exude spore masses in abundance than the variety *parasitica*. Perhaps this accounts for the ease with which the variety propagates itself in nature. The chief cultural differences of the two are as follows:

(1) Var. *parasitica* fruits more abundantly, and exudes the sticky spore masses much more conspicuously, than does *Endothia gyrosa*. (2) The variety fruits earlier than the species, as determined by the exuding spore drops. (3) The variety has less evident, smaller, or more embedded fruiting bodies than the species, in which they are often elevated, distinct pustules, rarely hidden by the exuding spore mass. (4) The species develops a much more luxuriant aerial mycelium (except possibly on potato agar) than does the variety. (5) The species has its aerial mycelium more generally and more highly orange colored, especially on oat-juice agar, than does the variety.

The more minute and variable differences of the two on the three media are as follows: On the potato-juice agar var. *parasitica* forms chiefly an embedded growth, which, while white at first, soon becomes rather deeply colored, and produces numerous obscure or embedded fruiting bodies, which exude small, colored, sticky spore drops rather thickly over the surface of the agar. Finally, a slight surface growth of a flavus mycelium sometimes develops. The species differs in having at first a slightly more evident growth of mycelium, and finally having usually fewer, but larger, spore masses. The color of the embedded growth is variable, usually darker than in the variety, sometimes blackish, as if from bacterial contamination, but possibly due to variation in the composition of the medium.

On the Lima bean-juice agar var. *parasitica* produces fewer, but larger, fruiting bodies and spore drops than on the potato-juice agar, while its aerial mycelium is more evident, and varies from albus to sulphureus in color. The species makes a much more evident aerial growth than the variety, while its fruiting pustules are decidedly fewer, larger, more elevated and distinct, and exude spores less abundantly. The color is much more evident than in the variety, though variable even in the same tube, running from albus through sulphureus and flavus to even aurantiacus-miniatus on the edges where it is in contact with glass or medium.

On oat-juice agar the variety *parasitica* forms a somewhat more evident aerial mycelium, but has fewer pustules and less evident spore drops even than on the Lima bean-juice agar. It usually has a deeper color, which varies from albus to luteus. The species on oat-juice agar forms a very luxuriant growth, even more so than on Lima bean-juice agar, and though its fruiting bodies are not so numerous, they are often evident exposed pustules, only partially hidden by the spores mass, which exudes with difficulty. The color assumes its maximum development and is in strong contrast to that of the variety on the same medium. It is usually more uniform and intense in color than on the bean-juice agar, finally varying from luteus through aurantiacus to miniatus and even badius when in contact with the glass or medium. Part of the growth, especially on the upper edge, however, often remains albus.

The color of the spore masses of both forms varies in different cultures from sulphureus to nearly purpureus, depending apparently on age, variation of the medium, bacterial contamination, or other unknown factors. Likewise, a culture when renewed on the same medium sometimes acts somewhat differently for some unknown reason, as to luxuriance in mycelial growth or spore development, or color characters.

Tannic Acid in Cultures. Since tannin is found in such large quantities in the wood of chestnut, and since this varies according to the age of the tree, etc., it has been suggested previously in this paper that this variation may have some bearing upon the development of the chestnut blight. It was thought desirable, therefore, to study both the saprophytic *Endothia gyrosa* and the variety *parasitica* in artificial cultures containing different percentages of tannic acid (M. C. W. brand, U. S. P.) to determine how this affected their vigor, growth and spore production. These cultures have all been made by Mr. Stoddard under the writer's direction, and the data here given should be credited to both investigators. We have used mainly for this work two rather recent cultures of *E. gyrosa* on two species of oak from Washington, D. C., and four cultures of *E. gyrosa* var. *parasitica* on chestnut, two from Washington and two from

Per cent. of Tannin.	Result.	Endothia gyrosa Quercus sp.	Endothia gyrosa Quercus velutina.	E. gyrosa var. parasitica Castanea dentata.	E. gyrosa var. parasitica Castanea dentata.	E. gyrosa var. parasitica Castanea dentata.	E. gyrosa var. parasitica Castanea dentata.
4%	Grew...	5	8	8	8	7	5
	Failed..	3	0	0	0	1	3
4.8%	Grew...	6	6	7	8	7	7
	Failed..	2	2	1	0	1	1
6%	Grew...	7	5	5	7	8	7
	Failed..	1	3	3	1	0	1
8%	Grew...	4	4	6	4	4	4
	Failed..	4	4	2	4	4	4
10%	Grew...	0	2	3	3	4	6
	Failed..	8	6	5	5	4	2
10.5%	Grew...	1	0	6	4	5	5
	Failed..	7	8	2	4	3	3
11%	Grew...	2	1	8	4	5	3
	Failed..	6	7	0	4	3	5
11.5%	Grew...	1	1	5	5	4	5
	Failed..	7	7	3	3	4	3
12%	Grew...	2	2	5	6	5	5
	Failed..	6	6	3	2	3	3
14%	Grew...	0	0	1	0	0	0
	Failed..	8	8	7	8	8	8
Total No.	Grew...	28	29	56	49	49	48
	Failed..	52	51	24	31	31	32
Total %	Grew...	35%	36%	70%	61%	61%	60%
	Failed..	65%	64%	30%	39%	39%	40%

Connecticut. Of these four, three had been in culture only a few months, while one had been in culture over three years.

In each test we made three cultures of each of the above for duplication. We grew these on plain potato-juice agar, as checks for comparison, and also on this medium to which had been added the following percentages of tannic acid: 0.2, 0.4, 0.8, 1.2, 1.6, 2.4, 3.2, 4.0, 4.8, 6.0, 8.0, 10.0, 10.5, 11.0, 11.5, 12.0, 14.0; see Plate XXVII. These cultures were first made in 1912, and repeated in 1913 for confirmation, this time using five cultures of each in each test. The table shows the results of all these cultures in the tubes containing 4% or more of tannic acid. Those containing lower per cents. all grew, and so are omitted in the table. From the results of these investigations we obtained the following information:

(1) The growth of either fungus causes no darkening of the plain potato-juice agar, but when tannic acid is added, even as

low as 0.2 per cent. in case of var. *parasitica,* the growth of the fungus causes a darkening of the medium. This indicates an oxidation of the tannic acid by the fungus, since these tubes without the introduction of the fungus remain undarkened except with the higher percentages, when they color as soon as made, upon cooling. With *E. gyrosa,* this darkening scarcely takes place, and with var. *parasitica* is less evident in those tubes containing only 0.2 and 0.4 per cent. of tannic acid, but shows on all strengths above these with both fungi about the same, though appearing sooner with var. *parasitica.*

(2) The medium in the tannic acid tubes remains liquefied when 0.8 per cent. or more tannic acid is added. The acidity of potato-juice agar and, in the lower percentages, of tannic acid potato-juice agar, where darkening of the medium does not interfere, can be tested before and after growth of these fungi by titrating with $\frac{N}{20}$ Na O H, using phenolphthalein as an indicator. These tests show that after *E. gyrosa* or var. *parasitica* has fully developed in plain potato-juice agar the acidity is practically unchanged; but in tannic acid potato-juice agar both of these fungi cause a lowering in the acidity of the medium, and the higher the acidity usually the greater the loss, though not proportionately greater, as shown by the following tests:

Tannic Acid added (per cent.):	Acid Test before inoculation.	Acid Test after growth.	Loss in Acidity.
0.0	0.15 cc. $\frac{N}{20}$ Na O H	0.15 cc. $\frac{N}{20}$ Na O H	0.0
0.2	.9 " " " " "	0.4 " " " " "	0.5
0.4	1.2 " " " " "	0.85 " " " " "	0.35
0.8	1.8 " " " " "	... " " " " "	...
1.2	2.1 " " " " "	1.4 " " " " "	0.7
1.6	2.7 " " " " "	1.8 " " " " "	0.9

(3) Cultures of *E. gyrosa* var. *parasitica* containing 0.2, 0.4, 0.8 per cent. tannic acid show a more vigorous spore development than the check cultures of potato-juice agar without tannic acid. The same was true of *E. gyrosa* regarding mycelial development, but to a less extent, and possibly also as to spore development, though with this fungus the spores do not exude very abundantly in any case.

(4) At about 4 per cent. the loss in color, especially with *E. gyrosa,* becomes quite evident. In the liquefied tubes up to

4 per cent. tannic acid, the growth of the fungi tends to form a more or less firm coating over the surface, after the manner of growth on the solid medium. Above 4 per cent. the growth becomes gradually less evident, generally showing in floating patches, embedded masses, or lateral growths around the side of the glass. Finally, at the highest percentages, 10 to 14, growth entirely ceases, only one having been successful at the latter strength in any of the tubes.

(5) In the higher percentages of tannic acid *E. gyrosa* shows an enfeebled growth sooner than does var. *parasitica,* since at 6 to 8 per cent. it makes comparatively little growth, corresponding to that made by the variety at about 10 per cent. It generally fails entirely to make any growth at above 10 per cent., or only a poor growth above 8 per cent. in most of the tubes; while the variety in only one case made any growth above 12 per cent. and rarely any but a poor growth above 10 per cent.

(6) At the higher percentages the difference in the appearance of the two fungi is less marked than at the lower, so that from 4 per cent. up, where spore production of the variety is largely cut out, they are scarcely to be distinguished.

(7) There was some variation in development with the different cultures of the same fungus in the higher percentages of the tannic acid, as shown by one of the cultures of var. *parasitica* from Connecticut which had been in artificial culture for over three years failing to grow quite as well as the more recent cultures. These variations are perhaps not constant.

(8) All the preceding notes relate to cultures that were inoculated from plain potato-juice agar directly onto those containing various percentages of tannic acid. Another set of cultures was made in which each was brought up gradually through all the lower percentages of tannic acid. In these it was found that this gradual acclimatization to the tannic acid gave a somewhat more luxuriant growth of both fungi at the higher percentages than when transferred directly from the potato-juice agar to these.

Later experiments based on the preceding results were made with all our cultures of *E. gyrosa* (26 in number) and those of var. *parasitica* (22 in number), using two cultures of each and the following percentages of tannic acid: 4.0, 6.0, 8.0, 10.0. These cultures showed, as in the previous tests, that the variety *parasitica* will grow in higher per cents. of tannic acid and give a more evident development of mycelium than *E. gyrosa*. The details of this experiment are given in the appended table.

Per cent. of Tannin.	Name.	Grew.					Total.		Failed.	
		Good.	Fair.	Poor.	Slight.	Very Slight.	No.	Per cent.	No.	Per cent.
4%	Endothia gyrosa.............	6	15	10	0	0	31	59.6	21	40.4
	E. gyrosa var. parasitica......	18	23	2	0	0	43	97.6	1	2.4
6%	Endothia gyrosa.............	1	15	9	2	4	31	59.6	21	40.4
	E. gyrosa var. parasitica......	29	13	3	0	0	44	100.0	0	0.0
8%	Endothia gyrosa.............	0	0	9	13	7	29	55.7	23	44.3
	E. gyrosa var. parasitica......	15	14	5	3	0	37	84.1	7	15.9
10%	Endothia gyrosa.............	0	0	0	20	6	26	50.0	26	50.0
	Endothia gyrosa var. parasitica	2	15	8	13	0	38	86.3	6	13.7

INOCULATION EXPERIMENTS.

General Conditions, etc. These experiments were undertaken primarily to determine the parasitic tendency of *Endothia gyrosa* as compared with that of the variety *parasitica*. That the latter could produce cankers when inoculated into chestnuts had been abundantly proved by the work of Murrill and others. With most of our inoculations both the species and the variety were used at the same time, and checks were also included. Nearly all these inoculations were made from artificial cultures, and usually only with conidial spores. Ordinarily a small slit in the bark was made with a sharp scalpel, spores from the cultures were introduced on a needle, the wound covered with moist cotton, and then bound with paraffine paper or bicycle tape. After several weeks the covering was removed. The checks were treated in the same way, except that no spores were introduced into the wound.

In this way there were inoculated two- to three-year-old seedling chestnuts, four- or five-year-old chestnut sprouts, and two-year seedling oak at the Station Farm at Mount Carmel; six- to eight-year-old slow-growing chestnut seedlings at the Station forestry plantation at Rainbow; and two- to four-year-old oak sprouts in a waste lot at Highwood. The tables which follow give the data for all inoculations, since there are factors that apparently enter into their success that we had not in mind when the experiments were undertaken, namely:—length of time the fungus has been in artificial cultivation, age of the particular spores used, and time of year of the inoculation. This makes it difficult to judge of the results of certain of these inoculations, since two or more of these factors may have been involved. The final results of our inoculations were determined about the second week in October. Of course this gave some of the earlier inoculations made in May a much longer time to develop than those made in July, although these latter had plenty of time to show whether or not they were successful. We will consider the results briefly under the following headings.

Endothia gyrosa versus var. parasitica. Ordinarily it takes about a month to determine whether or not an inoculation has taken, and even then it is sometimes doubtful, since the tissues around the wound often die back for a short distance as the result of the mechanical injury. The sum total of our experiments brings out quite clearly the difference in the parasitic nature of these two fungi. For instance, 151 out of all of our 324 inoculations with var. *parasitica,* from all sources on all hosts, produced more or less evident cankers, that is, 47 per cent. were successful; while of the 148 similar inoculations with *E. gyrosa* only 2 took, or about 1 per cent. Of these two, one showed only a comparatively small dead area, with fruiting pustules, around the point of inoculation, but did not seem to continue its growth, while the other was on a dead seedling whose roots had been cut off by mice, which no doubt weakened it, allowing the fungus to make an excellent growth, and even to produce its ascospores. If we take into consideration only our inoculations of var. *parasitica* originally obtained from chestnut and inoculated into chestnut sprouts and seedlings, we find that out of 232 inoculations 132, or 57 per cent., took, as compared with entire failure of *E. gyrosa* under the same conditions. None of the 228 check trees in all our experiments showed any signs of infection, thus proving that the wounding alone was not harmful when protected from infection.

With the check trees the cutting usually killed a little bark on either side, especially if the knife was run under between the bark and the wood. This never grew larger, and the callus of new tissue formed in the wound was always healthy. With the wounds inoculated with *E. gyrosa,* sometimes this injured bark was a little more extensive than with the checks, which indicated a slight but futile attempt at parasitism. Occasionally, on this dead bark and exposed wood, a slight fruiting growth of the fungus as a saprophyte was formed.

With var. *parasitica,* however, the bark was gradually killed in an increasing area surrounding the point of inoculation, and this had a more or less irregular outline, spreading faster in some directions than in others. Eventually the whole stem or limb was encircled, if the inoculation was made early in the season (see Plate XXV a). At the inoculation point a callus of young tissue often developed, and the vitality of this was greater than that of the older tissues, since it often remained healthy, until, being entirely surrounded by dead tissues, it died as much from adverse nutritive conditions as from the direct action of the fungus (Plate XXV b).

After the cankers attained some size, their reddish dead bark often became cracked, and the Cytospora fruiting stage appeared in more or less abundance. An examination of the inoculations as late as the last of December, however, failed to show that the asco-stage had developed on any of them. Whether this means that ordinarily the mature fruiting stage does not appear until the second season, we do not know, but it shows that sometimes this is the case. The inoculations made early in May on the chestnut sprouts one to two inches in diameter entirely girdled these for six to eight inches, forming very evident cankers, but not always with a conspicuous development of conidial spores.

Hosts Inoculated. In the inoculation tests we used seedlings and sprouts of both chestnuts and oaks. Considering first only the chestnut hosts, we found that, as a rule, the variety *parasitica* could be more easily inoculated into the sprouts than into the seedlings, and that on the sprouts the blight made a larger growth in the same length of time. This greater development might in part be due to the larger size of the sprouts, which varied from about one-half to one and one-half inches in diameter, while the seedlings were only about one-quarter to three-quarters of an inch in diameter. Out of a total of 177 inoculations with cultures originally from chestnut made on chestnut seedlings, 91, or 51 per cent., took, as compared with

41 successful out of a total of 55, or 75 per cent., on the sprouts. An attempt to inoculate a young Japanese chestnut six inches in diameter failed entirely, although sixteen inoculations were made at two different periods. This seems to show that the tree had great resistance, if not immunity, to the disease.

As regards inoculation of chestnut, versus oaks, it was found that the former were much more readily infected than the latter, which showed only 12 successful infections out of 51, or 23 per cent. All of these were confined to the sprouts, and did not make nearly so vigorous growth as did the inoculations on chestnut sprouts. The oak seedlings used were rather small, and the inoculations were made comparatively late, using cultures obtained originally from both oak and chestnut.

Source of Cultures. Most of our inoculations were made with cultures obtained from chestnut, as at the time we had only one culture of var. *parasitica* from oak, namely *Quercus velutina* from Woodmont, Pa. This was inoculated into both chestnut and oak seedlings and sprouts. The inoculations into chestnut seedlings showed 4 successful out of 25, or about 15 per cent., while the 16 made on the chestnut sprouts all apparently failed, for some not very evident reason, possibly because made in July with old spores. Of the 20 inoculations on oak seedlings, all failed, while of the 12 on oak sprouts, 5, or 42 per cent., took more or less vigorously. From the results of the inoculations with this single culture, it would seem that the strain from oak at least was not quite so active a parasite as that from the chestnut itself.

Whether or not cultures from chestnuts from different regions, or from living as compared with dead trees, show any difference in virulence, we are not certain. In our experiments we did not get any conclusive results along this line. To determine these points accurately, however, one would need cultures that had only recently been obtained from their hosts, and whose spores when used were comparatively young and of the same age.

Age of Cultures. It seems quite probable that the longer the variety *parasitica* is kept in culture the more likely it is to lose, at least in part, its virulence. While no direct experiments were made to determine this point, it is possibly shown by the cultures obtained originally from a Japanese chestnut in Westville

RESULTS OF INOCULATIONS WITH ARTIFICIAL CULTURES OF *Endothia gyrosa* AND *E. gyrosa* VAR. *parasitica*. 1912

Fungus.	From Host.	Locality.	Culture obtained.	Age of Spores.	Cult. No.	Date Inoc.	Place.	Host Inoc.	Protection.	No. of Inoc.	Failed.		Very doubtful.	Took slightly.	Took well.
											%	No.			
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	43	7004[1]	June 4	Greenh.	C. dent. sdl.[1]	Paper	6	33	2	0	0	4
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	43	7004[1]	June 4	Greenh.	C. dent. sdl.[2]	Paper	6	33	2	0	0	4
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	43	7004[1]	June 4	Greenh.	Q. alba 2[a]	Paper	2	100	2	0	0	0
Check	....	....	....	..	......	June 4	Greenh.	C. dent. sdl. 2[a]	Paper	2	100	2	0	0	0
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	55	6758a[3]	May 9	Rainb.	C. dent. sdl.[3]	Paper	10	40	4	0	2	4
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	55	6757a[3]	May 9	Rainb.	C. dent. sdl.[4]	Tape	10	0	0	0	0	10
E. gy. par.	C. dent.	N. Lond., Ct.	4 O., '11	55	6527a[3]	May 9	Rainb.	C. dent. sdl.	Paper	10	50	5	0	1	4
E. gy. par.	C. cren.	Westv., Ct.	4 Au., '09	55	6594a[1]	May 9	Rainb.	C. dent. sdl.	Tape	10	50	5	0	0	5
E. gyrosa	Q. alba	Wash'n, D. C.	2 Ja., '12	64	6891	May 9	Rainb.	C. dent. sdl.	Paper	8	100?	5	3	0	0
E. gyrosa	Quer. sp.	Wash'n, D. C.	2 Ja., '12	55	6753a[1]	May 9	Rainb.	C. dent. sdl.[4]	Paper	8	100	8	0	0	0
E. gyrosa	Quer. sp.	Wash'n, D. C.	2 Ja., '12	64	6899	May 9	Rainb.	C. dent. sdl.[4]	Tape	8	100	8	0	0	0
E. gyrosa	Quer. sp.	Wash'n, D. C.	2 Ja., '12	55	6753a[2]	May 9	Rainb.	C. dent. sdl.	Tape	8	100	8	0	0	0
Checks	....	....	....	..	......	May 9	Rainb.	C. dent. sdl.	Paper	16	100	16	0	0	0
Checks	....	....	....	..	......	May 9	Rainb.	C. dent. sdl.	Tape	16	100	16	0	0	0
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	31	7004[3]	May 23	Station	C. cren.	Uncov.	8	100	8	0	0	0
E. gy. par.	C. dent.	Merid., Ct.	22 Jl., '12	19	7284[3]	Aug. 13	Station	C. cren.[4]	Tape	8	100	8	0	0	0
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	28	7092[3]	June 25	Mt. Car.	C. dent. sdl.[5]	Paper	25	24	6	0	0	19
E. gyrosa	Q. velut.	Wash n, D. C.	2 Ja., '12	102	6756a[2]	June 25	Mt. Car.	C. dent. sdl.[5]	Paper	20	95	19	0	0	1
Checks	....	....	....	..	......	June 25	Mt. Car.	C. dent. sdl.[5]	Paper	10	100	10	0	0	0
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	28	7092[1]	June 25	Mt. Car.	C. dent. sdl.[6]	Paper	25	4	1	0	3	21
E. gyrosa	Quer. sp.	Wash'n, D. C.	2 Ja., '12	102	6753a[3]	June 25	Mt. Car.	C. dent. sdl.[6]	Paper	15	100	15	0	0	0
Checks	....	....	....	..	......	June 25	Mt. Car.	C. dent. sdl.[6]	Paper	10	100	10	0	0	0
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	79	7002[1]	July 10	Mt. Car.	C. dent. sdl.	Tape	15	87?	12	1	2	0
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	79	7002[1]	July 10	Mt. Car.	C. dent. sdl.[7]	Tape	10	80	8	0	1	1
Checks	....	....	....	..	......	July 10	Mt. Car.	C. dent. sdl.	Tape	5	100	5	0	0	0
Checks	....	....	....	..	......	July 10	Mt. Car.	C. dent. sdl.[8]	Tape	10	100	10	0	0	0
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	84	6985[1]	July 10	Mt. Car.	C. dent. sdl.[4]	Tape	10	70	7	0	1	2
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	84	6985[1]	July 10	Mt. Car.	C. dent. sdl.[7]	Tape	10	100	10	0	0	0
Checks	....	....	....	..	......	July 10	Mt. Car.	C. dent. sdl.	Tape	10	100	10	0	0	0
E. gy. par.	C. dent.	Brist., Ct.	24 Fe., '11	250	6598[3]	July 10	Mt. Car.	C. dent. sdl.	Tape	10	90	9	0	0	1
E. gy. par.	C. dent.	Brist., Ct.	24 Fe., '11	250	6598[3]	July 10	Mt. Car.	C. dent. sdl.[7]	Tape	10	100?	9	1	0	0
Checks	....	....	....	..	......	July 10	Mt. Car.	C. dent. sdl.	Tape	10	100	10	0	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	81	7016[2]	July 10	Mt. Car.	C. dent. sdl.	Tape	5	100	5	0	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	81	7016[3]	July 10	Mt. Car.	C. dent. sdl.[7]	Tape	10	100	10	0	0	0
Checks	....	....	....	..	......	July 10	Mt. Car.	C. dent. sdl.[8]	Tape	10	100	10	0	0	0

E. gyrosa	C. dent.	Con'lsv., Pa.	18 Ap., '12	79	7003^2	July 10	Mt. Car.	C. dent. sdl.[3]	Tape	5	100	5	0	0	0
E. gyrosa	C. dent.	Con'lsv., Pa.	18 Ap., '12	79	7003^2	July 10	Mt. Car.	C. dent. sdl.[7]	Tape	10	100	10	0	0	0
E. gy. par.	C. dent.	Wash'n, D. C.	2 Ja., '12	84	6985^1	July 10	Mt. Car.	C. dent. sdl.[4]	Uncov.	10	100	10	0	0	0
Checks	....	....	....	..	......	July 10	Mt. Car.	C. dent. sdl.	Uncov.	10	100	10	0	0	0
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	84	7004^1	July 15	Mt. Car.	C. dent. sdl.	Tape	5	100	5	0	0	0
E. gy. par.	C. dent.	Mt. Car., Ct.	Fresh Cytospora	spores	......	July 15	Mt. Car.	C. dent. sdl.	Tape	10	60	6	0	2	2
E. gy. par.	C. dent.	Mt. Car., Ct.	Fresh ascospore	s	......	July 15	Mt. Car.	C. dent. sdl.	Tape	10	40	4	0	1	5
E. gy. par.	C. dent.	Woodbr., Ct.	3 Fe., '11	28	7090^1	June 25	Mt. Car.	C. dent. spr.	Paper	8	0	0	0	0	8
E. gyrosa	Q. velut.	Wash'n, D. C.	2 Ja., '12	84	$6756f^3$	June 25	Mt. Car.	C. dent. spr.	Paper	4	75?	1	2	1	0
Checks	....	....	....	..	......	June 25	Mt. Car.	C. dent. spr.	Paper	4	100	4	0	0	0
E. gy. par.	C. dent.	Woodbr., Ct.	3 Fe., '11	251	6599^2	July 11	Mt. Car.	C. dent. spr.	Tape	4	50	2	0	0	2
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	80	7002^1	July 11	Mt. Car.	C. dent. spr.[7]	Tape	16	100?	15?	1	0	0
E. gyrosa	C. dent.	Con'lsv., Pa.	18 Ap., '12	80	7003^2	July 11	Mt. Car.	C. dent. spr.	Tape	14	100?	12	2	0	0
E. gyrosa	C. dent.	Blcks'g, Va.	27 Fe., '12	85	6979^2	July 11	Mt. Car.	C. dent. spr.	Tape	4	100	4	0	0	0
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	84	7004^1	July 15	Mt. Car.	C. dent. spr.	Tape	5	40?	1	1	0	3
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	84	7004^1	July 15	Mt. Car.	C. dent. spr.[7]	Tape	10	80	8	0	0	2
E. gy. par.	C. dent.	Mt. Car., Ct.	Fresh Cytospora	spores	......	July 15	Mt. Car.	C. dent. spr.	Tape	10	20	2	0	1	7
E. gy. par.	C. dent.	Mt. Car., Ct.	Fresh Cytospora	spores	......	July 15	Mt. Car.	C. dent. spr.[7]	Tape	18	0	0	0	0	18
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	81	7002^1	July 12	Mt. Car.	Q. rubra sdl.	Tape	10	100	10	0	0	0
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	81	7002^1	July 12	Mt. Car.	Q. rubra sdl.[9]	Uncov.	10	100	10	0	0	0
Checks	....	....	....	..	......	July 12	Mt. Car.	Q. rubra sdl.	Tape	5	100	5	0	0	0
Checks	....	....	....	..	......	July 12	Mt. Car.	Q. rubra sdl.[10]	Uncov.	5	100	5	0	0	0
E. gy. par.	C. dent.	Phila., Pa.	18 Ap., '12	81	7004^1	July 12	Mt. Car.	Q. rubra sdl.	Tape	10	100	10	0	0	0
E. gyrosa	C. dent.	Blcks'g, Va.	27 Fe., '12	86	6979^2	July 12	Mt. Car.	Q. rubra sdl.	Tape	5	100	5	0	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	74	7016^2	July 12	Mt. Car.	Q. rubra sdl.	Tape	5	100	5	0	0	0
Checks	....	....	....	..	......	July 12	Mt. Car.	Q. rubra sdl.	Tape	5	100	5	0	0	0
E. gy. par.	C. dent.	Westv., Ct.	23 My., '12	33	7103^2	July 3	Highw.	Q. alba spr.	Tape	2	0	0	0	0	2
E. gy. par.	C. dent.	Westv., Ct.	23 My., '12	33	7103^2	July 3	Highw.	Q. alba spr.[7]	Tape	2	0	0	0	0	2
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	44	7066	July 3	Highw.	Q. alba spr.	Tape	4	50	2	0	2	0
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	44	7066	July 3	Highw.	Q. alba spr.[7]	Tape	4	75	3	0	0	1
E. gyrosa	Q. alba.	Wash'n, D. C.	2 Ja., '12	76	6992^1	July 3	Highw.	Q. alba spr.	Tape	2	100	2	0	0	0
E. gyrosa	Q. alba.	Wash'n, D. C.	2 Ja., '12	76	6992^1	July 3	Highw.	Q. alba spr.[7]	Tape	2	100	2	0	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	65	7016^1	July 3	Highw.	Q. alba spr.	Tape	4	100	4	0	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	65	7016^1	July 3	Highw.	Q. alba spr.[7]	Tape	4	100	4	0	0	0
E. gy. par.	C. dent.	Westv., Ct.	23 My., '12	33	7103^2	July 3	Highw.	Quer. sp. spr.	Tape	1	0	0	0	1	0
E. gy. par.	C. dent.	Westv., Ct.	23 My., '12	33	7103^2	July 3	Highw.	Quer. sp. spr.[7]	Tape	2	0	0	0	2	0
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	44	7066	July 3	Highw.	Quer. sp. spr.	Tape	2	50	1	0	0	1
E. gy. par.	Q. velut.	Woodm., Pa.	18 Ap., '12	44	7066	July 3	Highw.	Quer. sp. spr.[7]	Tape	2	50	1	0	1	0
E. gyrosa	Q. alba.	Wash'n, D. C.	2 Ja., '12	76	6992^1	July 3	Highw.	Quer. sp. spr.	Tape	1	100	1	0	0	0
E. gyrosa	Q. alba.	Wash'n, D. C.	2 Ja., '12	76	6992^1	July 3	Highw.	Quer. sp. spr.[7]	Tape	2	100?	1	1	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	65	7016^1	July 3	Highw.	Quer. sp. spr.	Tape	2	100?	0	2	0	0
E. gyrosa	Quer. sp.	Tryon, N. C.	24 Ap., '12	65	7016^1	July 3	Highw.	Quer. sp. spr.[7]	Tape	2	100?	0	2	0	0

CONDENSED RESULTS OF INOCULATIONS WITH ENDOTHIA GYROSA AND ENDOTHIA GYROSA PARASITICA.

	Inoc. (No.)	Failed (No.)	Took (No.)	Took %
E. g. parasitica from Cast. on Cast. dent. seedl.	177	86	91	51
" " " " " " " " sprts.	55	14	41	75
" " " " " " Quer. sp. seedl.	12	12	0	0
" " " " " " " " sprts.	7	0	7	100
" " " " Querc. on Cast. dent. seedl.	25	21	4	16
" " " " " " " " sprts.	16	16[11]	0	0
" " " " " " Quer. sps. seedl.	20	20	0	0
" " " " " " " " sprts.	12	7	5	42
E. gyrosa " Cast. on Cast. dent. seedl.	15	15	0	0
" " " " " " " sprts.	18	18	0	0
" " " " " Quer. sps. seedl.	5	5	0	0
" " " " " " " sprts.	0	0	0	0
" " " Querc. on Cast. dent. seedl.	82	81	1	1
" " " " " " " sprts.	4	3	1	25
" " " " " Quer. sp. seedl.	5	5	0	0
" " " " " " " sprts.	19	19	0	0
Checks.......................... on all Castanea..	113	113	0	0
Checks.......................... on all Quercus ..	15	15	0	0

[1] Kept moist. [2] Kept dry. [1-2] One dry, one moist. [3] Culture originally from conidial spores. [4] Culture from ascospores. [5] Trees ridged to produce drought conditions. [6] Trees unridged. [7] Inoculated above and below knife girdle. [8] Cut above and below knife girdle, but not inoculated. [9] Stem inoculated underground. [10] Stem cut underground, but not inoculated. [11] If done earlier in the season, possibly some would have taken. These footnotes apply chiefly to large table; see column "Host Inoc." for numbers.

on August 4, 1909, which produced only 50 per cent. infection as against 100 per cent. produced by a culture over two years younger obtained from Washington, D. C., on January, 2, 1912. Both of these were of the same spore age, and inoculated into chestnut seedlings at the same time and place.

That the age of the spores used affects their virulence is apparently shown in a number of our inoculations. We used spores from cultures that had been made all the way from 20 to 100 days, in a few cases even 250 days. These spores were always somewhat moist when used, and though possibly some of them were too old to germinate, there must have been others that were not, since we have renewed cultures not infrequently that were 100 days old, and in one case a culture that was 399 days old. Our inoculation tests apparently indicate that the younger the spores the higher the percentage of infection. For instance, on chestnut seedlings, cultures varying from 28 to 55 days old gave successful inoculations varying from 100 to 50 per cent.; while those 79 to 250 days old gave from 30 to 0 per cent. However, with the latter the time of inoculation may have entered into the problem, since in no case did we try to inoculate on the same date with spores of greatly different ages.

Time of Inoculation. Inoculations made in the spring are more successful than those made in midsummer, at least those we made in the spring were, as a rule, much more successful than those we made in July. However, as just stated, those made in the spring were made with younger spores than those made later, and just how much of the failure of the latter was due to the time of inoculation and how much to the age of the spores could not be determined. We have also tried inoculations on dormant seedlings in the greenhouse, and these have either failed to take or took only after the trees began to grow. The length of time the fungus has been in culture, age of the spores used, time of year the inoculation is made, are all points that need further investigation to bring out their bearings more clearly.

Condition of Host. We tried several experiments to determine what effect the condition of the host had on the success of the infection. These experiments included a few plants kept unusually wet and others very dry, in the greenhouse; others severely ridged outdoors to aid in drought conditions, compared with plants not ridged; and plants with knife cuts encircling the bark (in some cases with a band of bark removed) which were inoculated above and below these injured places. The results were rather conflicting, so that we could not tell whether or not these treatments made any special difference. Inasmuch as they did not show more striking evidence in favor of increased blight development under unfavorable conditions of the host, perhaps they may be interpreted as rather against, than in favor of, our theory that the condition of the host affects the prominence of the fungus as a parasite. However, such experiments need to be made in greater number and during several seasons in order to judge accurately as to results.

PREVENTIVE EXPERIMENTS.

Earlier Experiments. Murrill tried to control the chestnut disease, when it was first discovered at the New York Botanical Garden, by cutting down and destroying the badly infected trees and by cutting out cankers on those less seriously injured. He found this did not prevent its further spread. Writing in 1908, he (48) says: "Preventive measures have apparently not affected it in the slightest degree. Pruning of diseased branches has evidently failed to check it even in the case of very young trees. Branches have been carefully removed, and wounds covered, leaving trees apparently entirely sound, but upon inspection a few weeks or a few months later, they would be found badly diseased at other points." Merkel, at the New York Zoological Park, also tried to control the trouble by cutting down the badly infected trees and by spraying with Bordeaux mixture, but little or no benefit resulted from his efforts.

Metcalf undertook experiments to control the trouble on Long Island in a region where it was very bad. In 1909 he and Collins (36) say: "At present it is impossible definitely to record general beneficial results from any of the sprayings which have been undertaken or have been under observation. This may in part be due to the fact that it is yet too early to judge satisfactorily of the results, and in part perhaps to the infrequency of sprayings. * * * Almost the only treatment that can at present be safely recommended as surely retarding the spread of the disease, to a greater or less extent, is one which will never be of practical use except in the case of orchard trees or certain valuable ornamental trees. It consists essentially in cutting out the infected branches or areas of bark and carefully protecting the cut surfaces from outside infection by means of a coat of paint or tar. This cutting must be thoroughly done and the bark of every infected place entirely removed for a distance of at least an inch (when the size of the branch permits) beyond the characteristic, often fan-shaped, discolored area produced by the growing fungus in the inner bark." In a later report, they also advocate that when the inner bark is badly infected "at least two or three annual layers of wood beneath the diseased bark must also be gouged out."

Later Experiments. In a bulletin published in October, 1911, Metcalf and Collins (38, p. 10) advocate fighting the chestnut bark disease, in those regions or states where it has not yet obtained a serious foothold, by means of quarantine and cutting out all diseased trees. This recommendation was based on the results of some experiments carried on in the vicinity of Washington, D. C., concerning which they write as follows:

"Fortunately, however, there is a method of dealing with the situation which is applicable to the country as a whole and which, so far as tested, is practicable. Early in the course of the writers' investigations it became evident that the disease advances but slowly in a solid line, but instead spreads from isolated centers of infection often many miles in advance of the main line of disease. * * * It therefore seems probable that if these advance infections could be located at a reasonably early stage, they could be eliminated at relatively little expense, thus preventing further spread from these points, at least. Accordingly the country within approximately thirty-five miles of Washington, D. C., was chosen in the fall of 1908 as preliminary territory in which to test this method of control. This section has been gone over fairly thoroughly once a year. As will be shown by Figure 1, fourteen points of infection were located and the infected trees destroyed. Most of this work was done by the senior writer. The largest infection was a group of nursery trees that had been imported from New Jersey; the smallest, a simple lesion on a small branch of a large forest tree. In one case eleven forest trees in a group were infected, the original infection having been on two trees dating apparently from as early as 1907. Up to the present time (June, 1911) the disease has not reappeared at any point where eliminated, and the country within a radius of approximately thirty-five miles from Washington is apparently free from the bark disease, although new infections must be looked for as long as the disease remains elsewhere unchecked. It is therefore believed that this method of attack will prove equally practicable in other localities, and if carried out on a large scale, will result ultimately in the control of the bark disease."

Stewart, of the Geneva, N. Y., Station, and the writer, through the kindness of Metcalf, had the opportunity of examining, in January, 1912, part of the region where this work was carried on. Stewart (70) in his paper at Harrisburg said: "I hold that no definite conclusions can be drawn from that test." The writer also believes that the apparent results would not justify the application of the method on a wholesale scale in other regions, for the following reasons: (1) Apparently neither the chestnut tree nor the blight disease was very common in the region under experimentation; hence the greater difficulty of the disease starting there, and also the greater ease with which it could be controlled. (2) Although those in control evidently made a careful survey of the region for the blight, they overlooked infected trees. In a region with the chestnut tree and the disease more abundant, it would be impossible to locate all the diseased trees. (3) Where infected trees were cut down, the disease appeared on the bark of the stumps in some cases. To destroy the bark on the infected stumps as well is too great a task to be successfully accomplished without great expense. (4) No check areas, apparently, were reserved with which to compare the results of the treatment.

Yet, based on this experiment apparently, local advocates of such measures succeeded in having the State of Pennsylvania establish a chestnut blight commission to fight the disease in that state along these lines. To aid in the further study of the disease in all its aspects and in the control work, a grant of $275,000 was made by their Legislature. Shortly afterward, the United States Government also appropriated $80,000 for further work by Metcalf's department. With the aid of the government, and with more or less state aid, several of the states south of Pennsylvania have taken up this work, chiefly along the lines advocated by Metcalf and Collins, though apparently so far most of this work has been in the nature of preliminary surveys for locating the disease.

In order to have a clearer idea of what has been accomplished in a practical way in Pennsylvania by this commission, we recently wrote Carleton, who is now general manager, the following letter: "I understand from newspaper reports that the chestnut blight commission of Pennsylvania has found that spraying with Bordeaux mixture is effective in controlling the disease. I wish to ask for a statement from you concerning this report. Also, I should like very much to know what has been the outcome of your quarantine and cutting out work as carried on so far. Have you seen any conclusive evidence that this has been successful in checking the blight? Lastly, I should like to know if the blight on the whole, without regard to treatment in checking it, has spread as seriously in Pennsylvania during the past year as it did in 1911. So far as Connecticut is concerned, there seems to be a decided improvement, if we can judge by the reports that we have received."

In answer to this letter, under date of March 1, 1913, Carleton wrote as follows: "I have your letter of February 28th, and in reply will say first, that the reports in the papers about the spraying with Bordeaux mixture in connection with chestnut blight were, as usual, much exaggerated, and in some respects quite erroneous. The use of Bordeaux mixture is, at most, only a preventive, though the papers reported it to be a cure. Of course, as you know, nothing will cure the disease after it is in the tree. The Bordeaux was used on the estate of Pierre DuPont near Kennett Square. In connection with tree surgery methods, and by spraying about every two weeks during the summer, these two methods taken together appear to have controlled the blight. It is believed that the Bordeaux mixture was of great use in preventing the germination of spores on healthy trees, and on healthy portions of trees that were being treated. I believe the spraying with Bordeaux is of sufficient importance in chestnut orchards to recommend its practice in all cases of chestnut blight. It might be used, also, on unusually valuable lawn trees, but of course, it would be impracticable in forest tracts, chiefly on account of the cost, and for other reasons.

"As to the spread of the blight in Pennsylvania, I regret to say that over a large portion of the state it has apparently spread more rapidly than the year before, so that the conditions appear, therefore, to be different from those in Connecticut, according to your statement. Because of the condition last stated, of the serious increase of the disease in this state, and particularly in those portions west of the Susquehanna, where we are endeavoring to check its progress, you can see that our work has been unusually difficult. Answering your question, however, as to our success in actually checking the blight, so far as we can get evidence one way or the other at all in the short time that I have been in the state, I believe we have accomplished a great deal in that line. We can only actually know next summer, when we re-scout the areas over which cutting was done this summer. So far, in the areas of removal which have been re-inspected, the evidence is that our work has been very good. There was some return of the disease, of course, as was to be expected, but a rather small percentage."

Experiments in Connecticut. In Connecticut there has been no appropriation of money by the state to investigate the chestnut blight, and none has been asked for. Such work as has been done has been carried on by the botanical and forestry departments of this Station with funds at hand, and in connection with their other duties. There has been no attempt to enforce state control of the disease, or to eliminate it by the cutting out and quarantine method. There has been no demand for such treatment on the part of those interested. Preliminary surveys have shown that the disease now exists in all the towns, and in some of them to such an extent that any attempt to gain control of the fungus by the cutting out method, even if successful, could only be made at a cost disproportionate to the good that would be accomplished. Add to this the constant watch that would have to be maintained against re-infection, the opposition that would be aroused among some property owners by the enforced cutting, and we have sufficient reason for not attempting such a program in this state. Then, too, none of the surrounding states, Rhode Island, Massachusetts, or New York, is attempting such control.

In order, however, to gain some idea of the value of the cutting out method, two experiments, in coöperation with the forestry department, have been conducted in this state. The first was at the Whittemore estate in Middlebury, and was largely preliminary in nature, being carried out by Mr. Shepardson, manager of the estate, at our suggestion, but not immediately under our control. The disease was rather bad in certain of the woods on this large estate, and in a special effort to protect those nearest the residence, the removal of all infected trees was started in 1910. These woods have now been gone over four different years, each time removing all trees of whatever size showing cankers. Apparently this removal has had little effect in decreasing the disease in these particular woods. A count was not made of the number removed each year, except that Mr. Shepardson states that more were removed in the winter of 1913 than in all previous years. In these woods, something over one hundred acres, forty or fifty of which contained trees over one foot in diameter, 845 trees over one foot in diameter were marked for removal in the winter of 1912-13, besides numerous trees and sprouts of less diameter. This same winter, in all the woods on the estate, there were 2,200 trees over one foot in diameter that were marked for removal. In this experiment it was not attempted to remove the bark from the stumps. In certain badly diseased spots where the stumps were examined, it was found that perhaps 30 per cent. of them showed some signs of the fruiting stage of the fungus the following summer.

The second experiment was started in the fall of 1911, at the Portland state forest. Here certain designated wood lots, eight in number, were gone over, and all trees and sprouts showing cankers were noted and marked for removal. These were removed during the following winter, and the wood and bark disposed of. A partial reëxamination was made the next spring, to determine how effectively the work was done. In spite of the fact that the preliminary examination had been carefully made by two well-trained scientific men, and the ground had again been gone over by a practical man who removed the marked trees and any others he saw to be infected, it was found that some of the diseased trees had been overlooked. Six other lots in these woods were also examined, and the blighted trees counted, but not removed, these serving as a check to determine the benefit of removal in the other lots.

All of these lots were reëxamined in the fall of 1912, and the trees removed that winter, as before, from those lots reserved for removal. It is expected to keep up this experiment for several years, if warranted by the results or the prevalence of the blight. As yet it is too early to determine the effect of the removal of the trees on the spread of the blight by comparison with the check lots. So far as the second year's results go, however, there were proportionately just as many newly blighted trees found in lots where all had been removed the year before as in the lots where all diseased trees had been left.

RECOMMENDATIONS FOR CONNECTICUT.

We are not advocating concerted action throughout the state to attempt control of the disease by the cutting out method. We are only rarely advising this method, in certain districts where probable results might seem to warrant it, such as isolated woods recently and slightly infected, and of sufficient value to warrant the expense. Where a wood lot as a whole is merchantable, and the disease is present, we advocate that, if market conditions are favorable, it be cut and disposed of in the ordinary way. Where the trees are not as a whole of marketable size, and the disease is present, we advocate the removal of the dead and badly diseased trees and their disposal as lumber, poles, ties or cordwood, as their size will permit.

We have no uniform recommendations for treatment of sprout growth too small for market purposes, but as a usual thing no treatment is recommended. Where trees have been cut, and numerous sprouts are developing, it is perhaps advisable at the end of the second or third year to go over these and cut off all the diseased and weak ones, leaving only four to six vigorous ones, to renew the stand if possible.

We are trying to prevent a glut of the market by discouraging wholesale cutting of the forests, especially where there is little need of it. As yet there has been no general glut and drop of prices except on cordwood in certain towns, and 7 x 9 ties, for which the demand on the part of the railroad has evidently fallen off. On the whole, however, there has been considerable more timber cut than usual.

There are no small factories for the utilization of waste products such as tannin, etc., and the establishment of such here is not likely or advisable. In the recent investigations of the wood-using industries of Connecticut, by Pierson of the United States Department of Agriculture, published as Bulletin 174 of this Station, it is stated that the chestnut is used by nineteen different industries in wood manufacture, of which 50 per cent. of the supply used is for musical instruments. Of all the chestnut timber used, however, only 35 per cent. was Connecticut-grown.

Whether the consumption of the home-grown product can be profitably increased is a question we cannot answer here, but is worthy of the attention of the timber growers and buyers. The largest use made of the chestnut trees is for building timber, telephone poles, railroad ties, and cordwood. The latter, besides its extensive family use, is consumed in brick kilns, brass foundries and charcoal pits. Its consumption by brass factories, however, is on the decrease, due to the substitution of crude petroleum.

LITERATURE.

Although chestnut blight is a comparatively new disease, the literature on the subject has already become rather extended, because of the popular interest aroused. We do not aim to include all of the popular articles, but do include all articles, so far as we know, that relate to any special study of the disease. These are arranged alphabetically according to their authors, and for convenience in the preceding discussion have been referred to by the appended numbers.

1. **Anderson, P. J. and H. W.** The chestnut blight fungus and a related saprophyte. Phytop. 2: 204-10. O. 1912.
2. **Anderson, P. J. and H. W.** *Endothia virginiana.* Phytop. 2: 261-2. D. 1912.
3. **Baker, H. P.** The chestnut blight and the practice of forestry in Pennsylvania. Penn. Chest. Blight Confer.: 137-43. 1912.
4. **Benson, W. M.** Chestnut blight and its possible remedy. Penn. Chest. Blight Confer.: 229-33. 1912.
5. **Clinton, G. P.** Chestnut bark disease, *Diaporthe parasitica* Murr. Conn. Agr. Exp. Stat. Rept. 1907-8: 345-6. My. 1908.
6. **Clinton, G. P.** Chestnut bark disease, *Diaporthe parasitica* Murr. Conn. Agr. Exp. Stat. Rept. 1907-8: 879-90. Jl. 1909. [Illust.]
7. **Clinton, G. P.** Chestnut bark disease. Conn. Agr. Exp. Stat. Rept. 1909-10: 716-17, 725. Je. 1911.
8. **Clinton, G. P.** Some facts and theories concerning chestnut blight. Penn. Chest. Blight Confer.: 75-83. 1912.
9. **Clinton, G. P.** The relationships of the chestnut blight fungus. Science 36: 907-14. 27 D. 1912.
10. **Clinton, G. P.** Chestnut blight fungus and its allies. Phytop. 2: 265-9. D. 1912.
11. **Clinton, G. P., and Spring, S. N.** Chestnut blight conference. Conn. Farmer 41*: 7. 25 N. 1911.
12. **Clinton, G. P., and Spring, S. N.** Chestnut blight situation in Connecticut. Penn. Chest. Blight Confer.: 154-7. 1912.
13. **Collins, J. F.** Chestnut bark disease. North. Nut Grow. Rept. 1911: 37-49. 1912.
14. **Collins, J. F.** Some observations on experiments with the chestnut bark disease. Phytop. 2: 97. Ap. 1912.
15. **Collins, J. F.** Historical review and pathological aspects of the chestnut bark disease. Penn. Chest. Blight Confer.: 28-39. 1912. [Illust.]
16. **Collins, J. F.** Treatment of orchard and ornamental trees. Penn. Chest. Blight Confer.: 59-69. 1912.
17. **Craighead, F. C.** Insects contributing to the control of the chestnut blight disease. Science 36: 825. 13 D. 1912.
18. **Detwiler, S. B.** Chestnut blight in various stages. Penn. Chest. Blight Confer. Circ. Let.: 1. 18 O. 1911. [Illust.]

19. **Detwiler, S. B.** The Pennsylvania program. Penn. Chest. Blight Confer.: 129-36. 1912.

20. **Farlow, W. G.** Fungus of the chestnut tree blight. Penn. Chest. Blight Confer.: 70-5. 1912.

21. **Farlow, W. G.** The fungus of the chestnut tree blight. Science 35: 717-22. 10 My. 1912.

22. **Francis, T. E.** Field work of the chestnut tree blight commission. Penn. Chest. Blight Confer.: 233-5. 1912.

23. **Fullerton, H. B.** Chestnut blight. Long Isl. Agron. 5: 9-10. F. 1912.

24. **Fulton, H. R.** Recent notes on the chestnut bark disease. Penn. Chest. Blight Confer.: 48-56. 1912.

25. **Gaskill, A.** The chestnut blight. N. J. For. Pk. Res. 1907: 45-46. 1908. *Ibid.* 1908: 33. 1909. *Ibid.* 1909: 48. 1910. *Ibid.* 1910: 69-70. 1911.

26. **Giddings, N. J.** The chestnut bark disease. W. Virg. Agr. Exp. Stat. Bull. 137: 209-25. Mr. 1912. [Illust.]

27. **Graves, A. H.** The chestnut bark disease in Massachusetts. Phytop. 2: 99. Ap. 1912.

28. **Hodson, E. R.** Extent and importance of the chestnut bark disease. U. S. Dept. Agr. For. Ser. Circ. 21 O. 1908.

29. **Höhnel, Fr. v.** Fragmente zur Mykologie. Sitz. Kais. Akad. d. Wiss. Wien 118^1: 1479-81. N. 1909.

30. **Manson, M.** The chestnut tree disease. Science 35: 269-70. 16 F. 1912.

31. **Marlatt, C. L.** Pests and parasites. Nat. Geogr. Mag. 1911: 345. Ap. 1911. [Illust.]

32. **Merkel, H. W.** A deadly fungus on the American chestnut. N. Y. Zool. Soc. Rept. 10: 96-103. Ja. 1906.

33. **Metcalf, H.** Immunity of the Japanese chestnut to the bark disease. U. S. Dept. Agr. Bur. Pl. Ind. Bull. 121^6: 1-4. 10 F. 1908.

34. **Metcalf, H.** Diseases of ornamental trees. U. S. Dept. Agr. Yearbook 1907: 489-90. 1908.

35. **Metcalf, H.** The chestnut bark disease. Journ. Eco. Ent. 5: 222-30. Ap. 1912. [Illust.]

36. **Metcalf, H., and Collins, J. F.** The present status of the chestnut bark disease. U. S. Dept. Agr. Bur. Pl. Ind. Bull. 141^5: 45-54. 30 Au. 1909.

37. **Metcalf, H., and Collins, J. F.** The chestnut bark disease. Science 31: 749. 13 My. 1910.

38. **Metcalf, H., and Collins, J. F.** The control of the chestnut bark disease. U. S. Dept. Agr. Farm. Bull. 467: 1-24. 28 O. 1911.

39. **Metcalf, H., and Collins, J. F.** The present known distribution of the chestnut bark disease. Science 35: 421. 15 Mr. 1912.

40. **Mickleborough, J.** The blight on chestnut trees. For. and Irr. 14: 585-8. N. 1908. [Illust.]

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44. **Mowry, J. B.** The chestnut bark disease. Rept. Comm. For. R. I. 6:30-7. 1912. [Illust.]

45. **Murrill, W. A.** A serious chestnut disease. Journ. N. Y. Bot. Gard. 7:143-53. Je. 1906. [Illust.]

46. **Murrill, W. A.** Further remarks on a serious chestnut disease. Journ. N. Y. Bot. Gard. 7:203-11. S. 1906. [Illust.]

47. **Murrill, W. A.** A new chestnut disease. Torreya 6:186-9. S. 1906. [Illust.]

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51. **Murrill, W. A.** Why the chestnut canker cannot be controlled by cutting-out method. Penn. Chest. Blight Confer.: 194-5. 1912.

52. **Pantanelli, E.** Sul parassitismo di *Diaporthe parasitica* Murr. per il castagno. Rend. Accad. Lincei. s. 5 20^1:366-72. 5 Mr. 1911.

53. **Pantanelli, E.** Su la supposta origine europea del cancro americano del castagno. Rend. Accad. Lincei. s. 5 21, 2, 12:869-75. D. 1912.

54. **Penn. Blight Comm.** The Penn. Chest. Blight Confer.: 1-253. 1912. [Illust.]

55. **Penn. Blight Comm.** The chestnut blight disease. Penn. Chest. Tree Blight Comm. Bull. 1:1-9. O. 1912. [Illust.]

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63. **Rumbold, C.** The possibility of a medicinal remedy for chestnut blight. Penn. Chest. Blight Confer.: 57-8. 1912.

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65. **Shear, C. L.** The chestnut blight fungus. Phytop. 2:211-12. O. 1912.

66. **Shear, C. L.** *Endothia radicalis* (Schw.). Phytop. 3:61. F. 1913.

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69. **Spaulding, P.** Notes upon tree diseases in the eastern states. Mycol. 4: 148-9. My. 1912.

70. **Stewart, F. C.** Can the chestnut bark disease be controlled? Penn. Chest. Blight Confer.: 40-5. 1912.

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72. **Wells, H. E.** A report on scout work on the north bench of Bald Eagle mountain, Pa. Penn. Chest. Blight Confer.: 235-41. 1912.

73. **Williams, I. C.** The new chestnut bark disease. Science 34: 397-400. 29 S. 1911.

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GENERAL SUMMARY.

(1) Chestnut blight was first noticed in this country by Merkel, of the New York Zoological Park in 1904, and in 1906 was attributed by Murrill, of the New York Botanical Garden, to a fungus which he described as new to science, and called Diaporthe parasitica.

(2) The chestnut blight fungus has now been found in twelve states, from New Hampshire and Vermont on the north to Virginia and West Virginia on the south, and the damage that it has caused has been variously estimated from twenty-five to one hundred million dollars.

(3) The fungus consists of a conidial, or Cytospora stage, and a mature, or asco-stage, produced one after the other in the orange- to chestnut-colored fruiting bodies, which break out of the bark as small, more or less clustered pustules. The fungus has also rarely been found on oaks, where as yet it causes no particular damage. In artificial cultures only the conidial stage occurs, whose spores exude in viscid drops, or rarely in tendrils as in nature. Artificial inoculation of chestnut sprouts or seedlings produces the characteristic cankers in the bark, and these can be produced somewhat in oak sprouts.

(4) This fungus has been found by Farlow, the writer, and others, to come more properly under the genus Endothia

than Diaporthe. It has two saprophytic or semi-parasitic relatives in this country, known as Endothia radicalis and Endothia gyrosa. The latter also occurs on chestnut, and the chestnut blight, being very similar morphologically, has been referred to it by the writer as a parasitic variety called Endothia gyrosa var. parasitica. Others have considered the two as entirely distinct species, and still others as forms so closely related as to be identical morphologically.

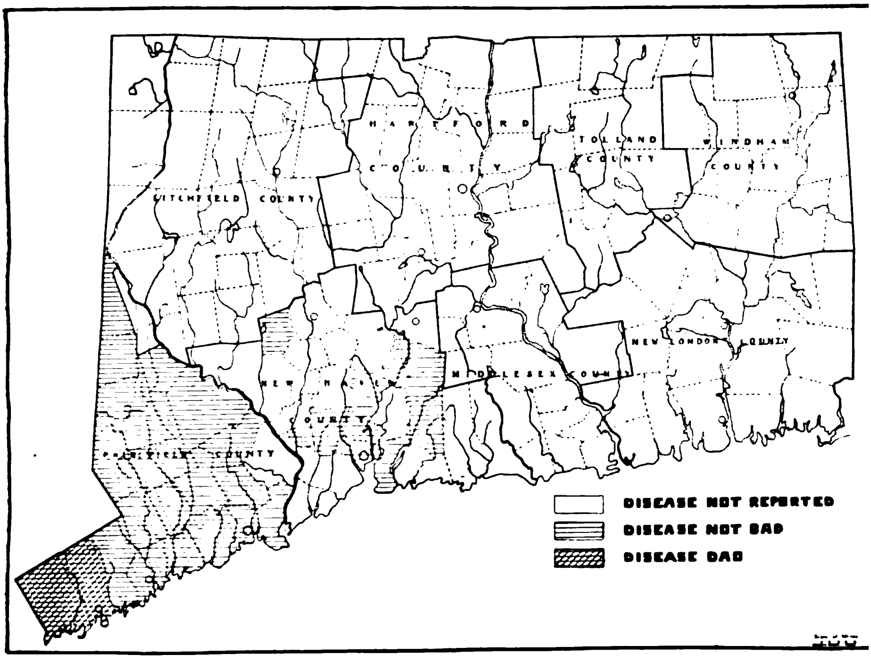
(5) While no record, either here or abroad, has been found of any previous outbreak of the blight fungus, there have been reported at different times in the past century unknown chestnut troubles in the southeastern United States that possibly may have been due to it.

(6) The blight fungus has been considered by Metcalf as an importation from Japan, and by Shear as introduced from Europe, while the writer maintains that it is a native fungus, which, because of peculiar conditions detrimental to the host, has assumed unusual virulence and widespread prominence.

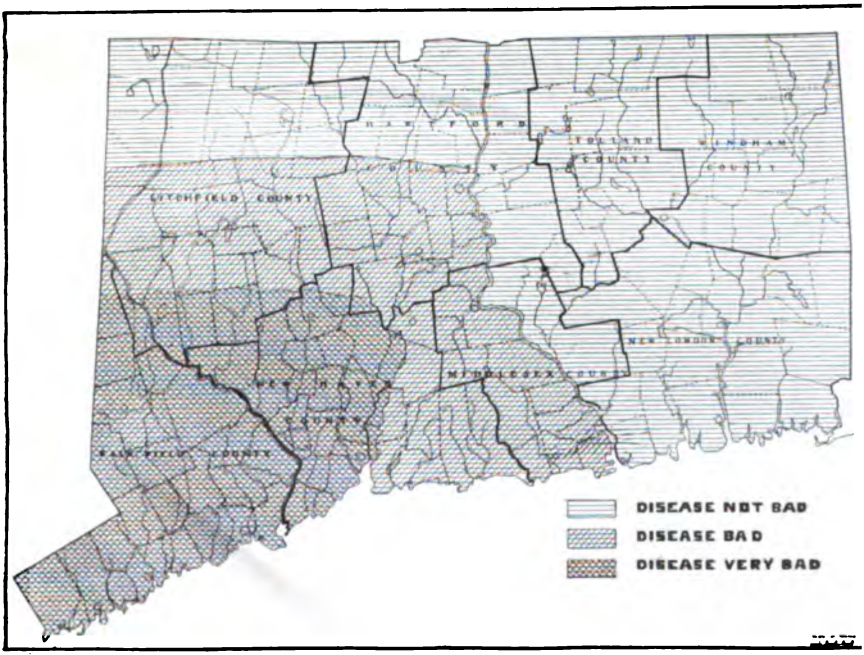
(7) These conditions unfavorable to the host were in part the unusually severe winter of 1903-04, which injured trees in general in the northeastern United States, and after which the blight suddenly made its appearance, and in part the subsequent unfavorable seasons for trees, especially the last four or five years, when summer droughts were unusually severe.

(8) If the writer's conclusions are correct, then it is useless to try to make a widespread fight against the fungus, since it will, under conditions favorable to the host, return in time to its former inconspicuous parasitism. If they are incorrect, it is still a question whether or not the cutting out and quarantine method is effective and can be carried on so economically and extensively as to be of practical value.

PLATE XX

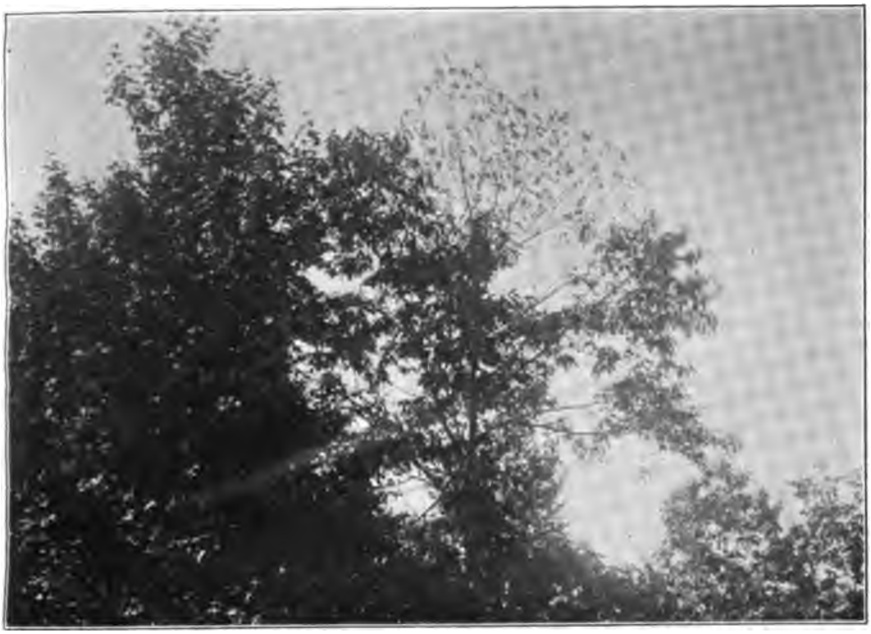


a. Known Distribution of Chestnut Blight in 1908.

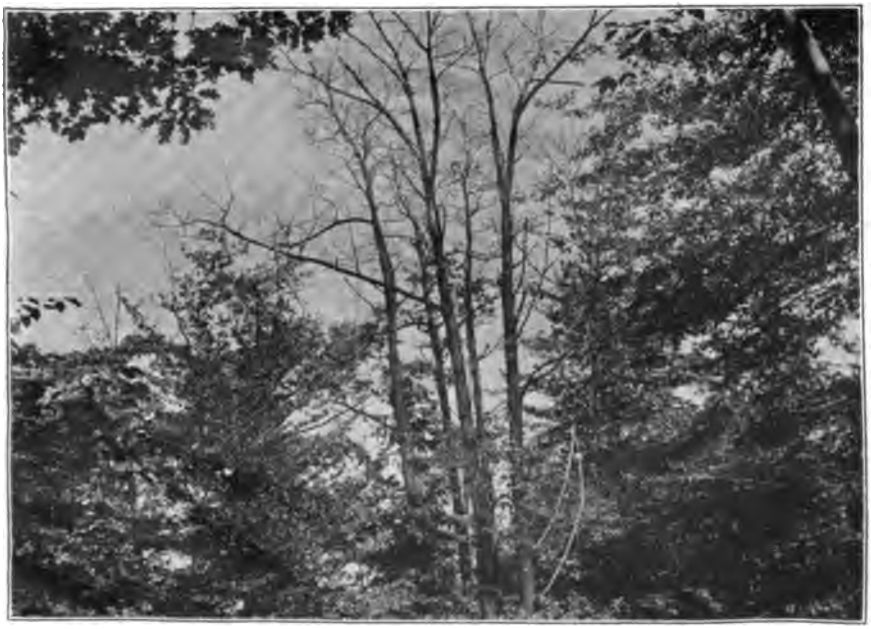


b. Known Distribution of Chestnut Blight in 1912.

DISTRIBUTION OF CHESTNUT BLIGHT IN CONNECTICUT, p. 371.



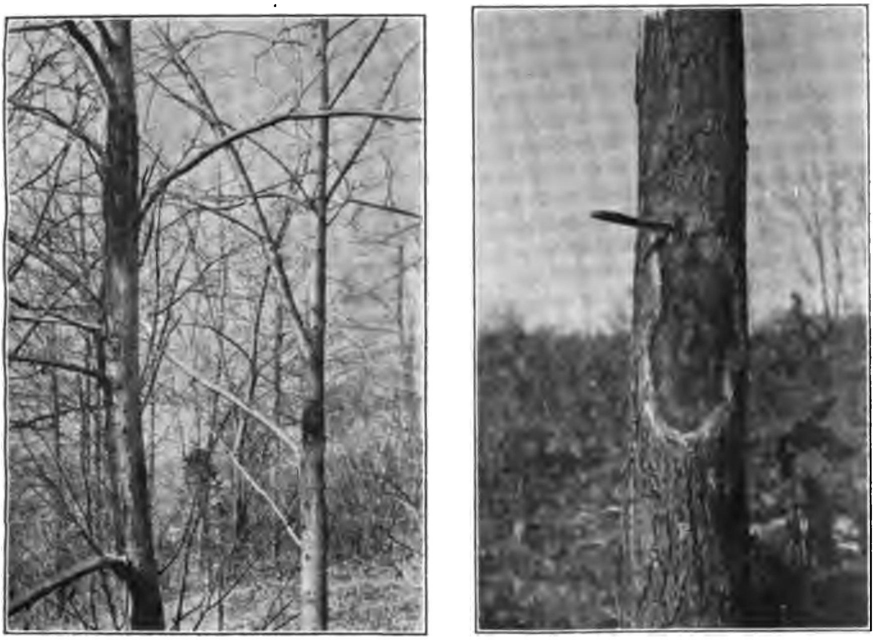
a. Tree with single branch killed, p. 365.



b. Trees killed by Chestnut Blight.

CHESTNUT TREES INJURED BY BLIGHT.

PLATE XXIII



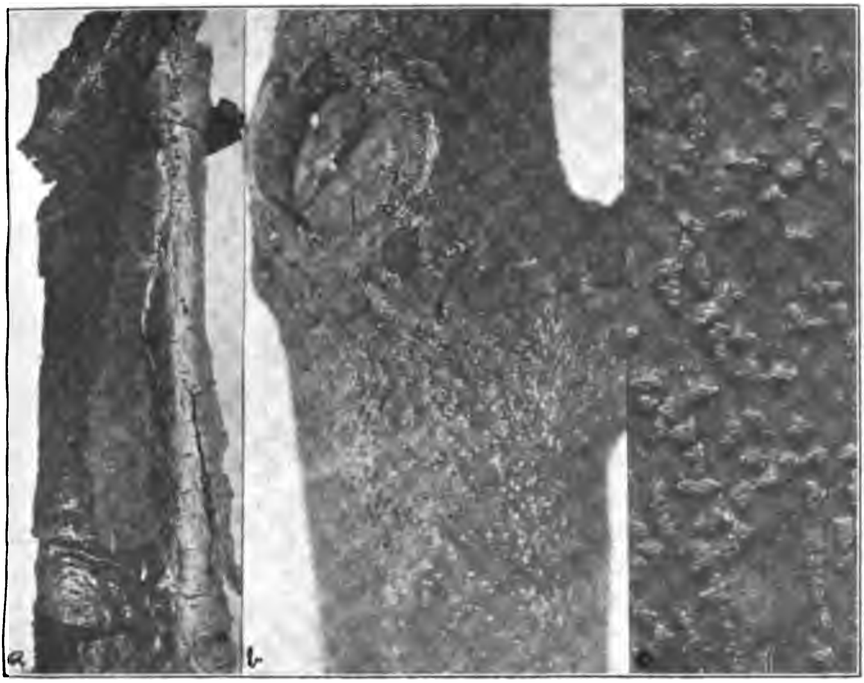
a–b. Cankers on smooth (a) and rough (b) barked trees, p. 364.

c. Winter-injured tree, p. 392.

d. Injury showing on pole, p. 365.

CHESTNUT BLIGHT INJURY, ETC.

PLATE XXIV.



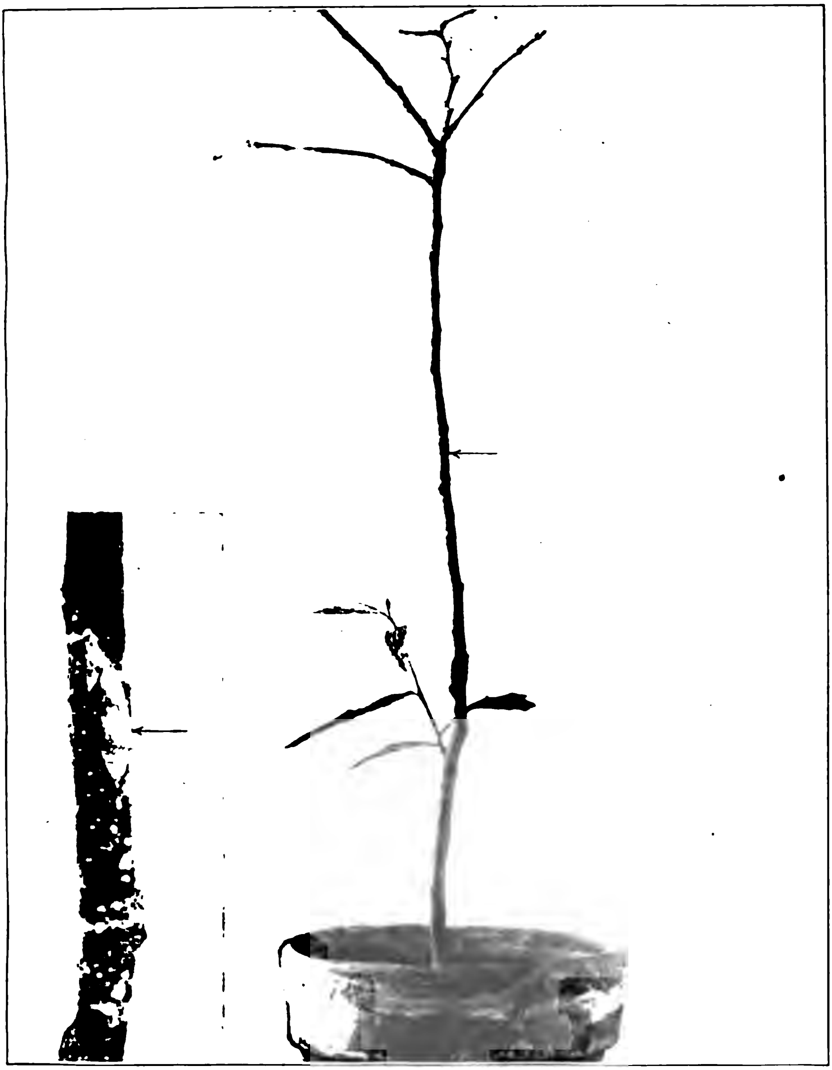
a-b. Blight started through insect injury (a), and pruned branch (b);
c. Mature fruiting pustules on smooth bark, p. 366.

d. Blight on rough bark.

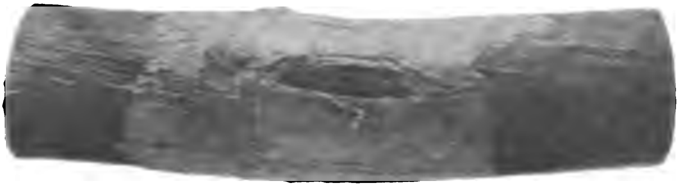
e. Fruiting pustules of *E. radicalis*, p. 419

FRUITING PUSTULES OF BLIGHT AND ENDOTHIA RADICALIS.

PLATE XXV.



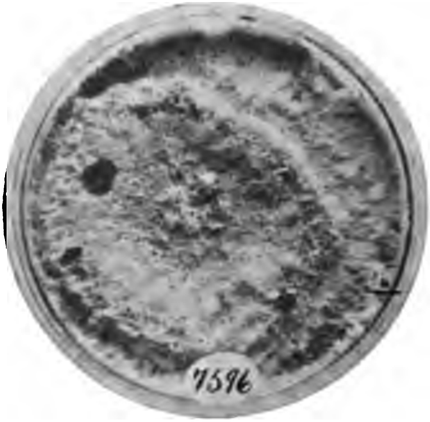
a. Tree killed above inoculation point ; canker shown by the enlarged stem, p. 436.

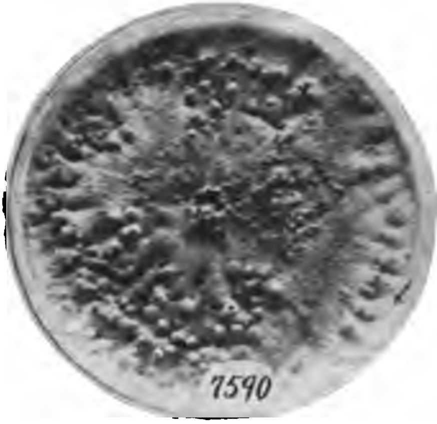


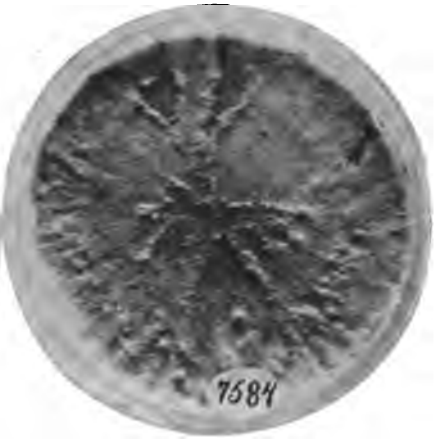
b. Sprout with dead bark around inoculation point, p. 366.

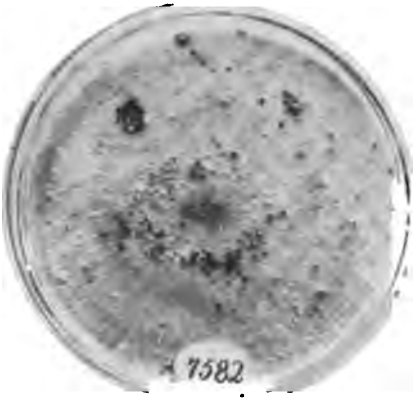
ARTIFICIAL INOCULATIONS OF BLIGHT.

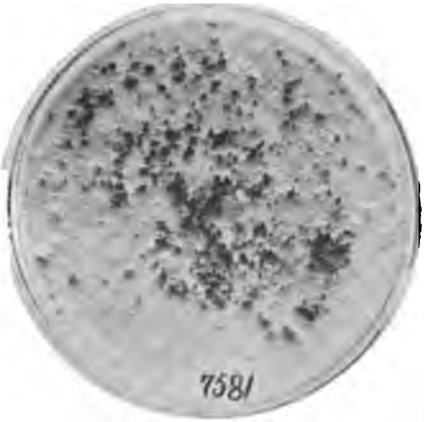
PLATE XXVI.







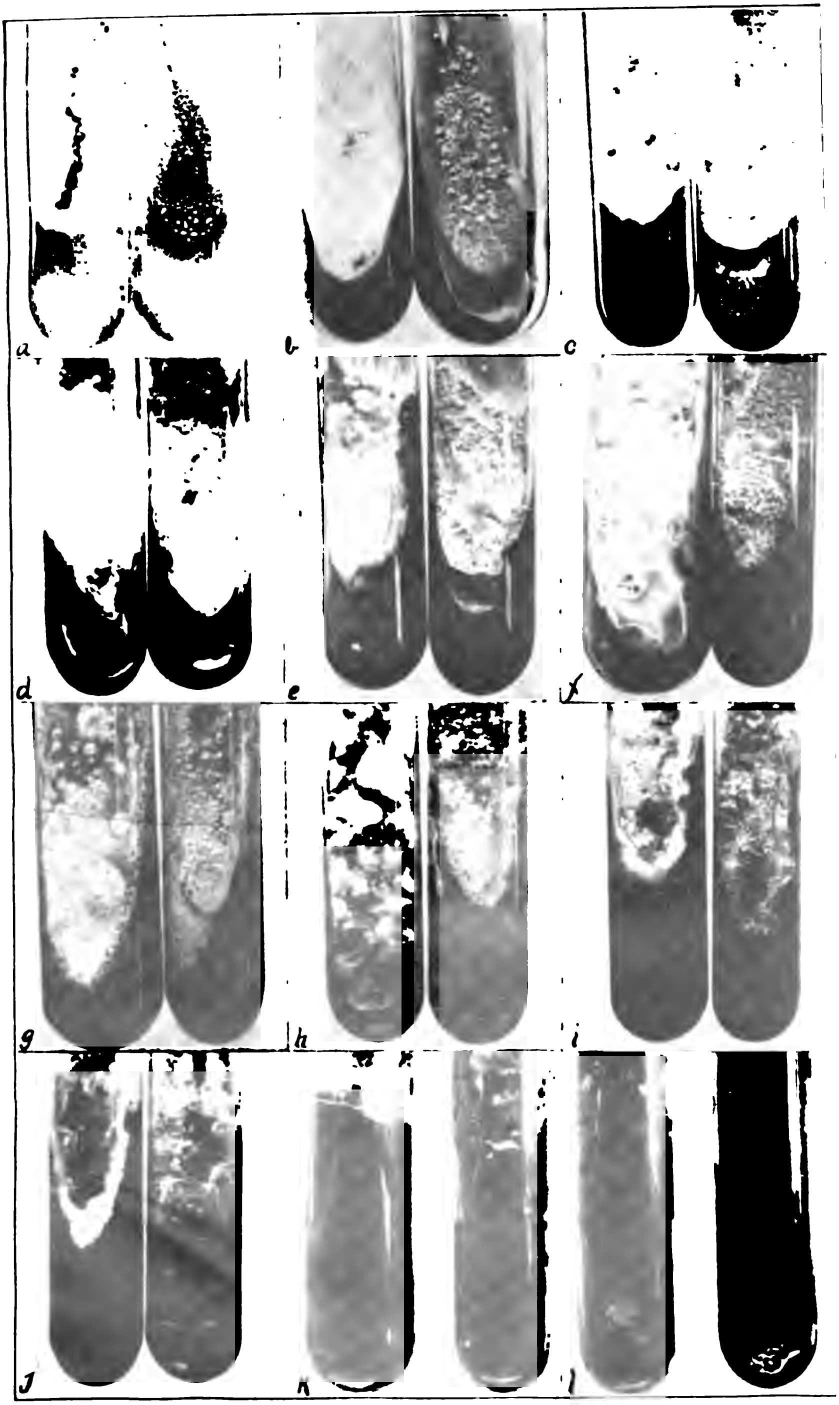




7596. *E. radicalis.* 7590, 7584. *E. gyrosa.* 7582, 7581. *E. gyrosa* var. *parasitica.*

PETRIE DISH CULTURES OF THREE AMERICAN ENDOTHIAS.

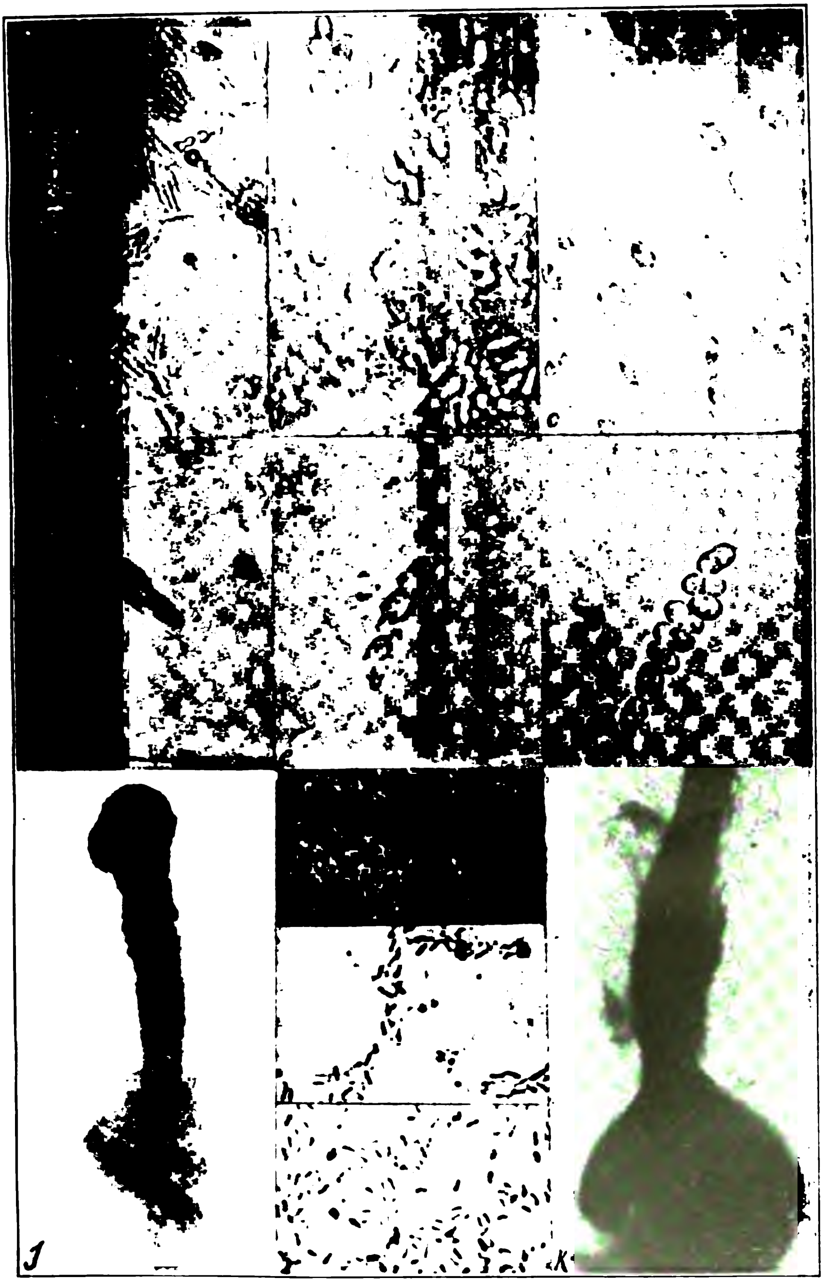
PLATE XX



a–l. *E. gyrosa* first in each case, on following per cents.: a, 0; b, .2; c, .4; d,
e, 1.2; f, 1.6; g, 2.4; h, 3.2; i, 4.; j, 4.8; k, 6.; l, 10.

TANNIC ACID CULTURES OF ENDOTHIA GYROSA AND VAR. PARASITICA, p. 4

PLATE XXVIII.



a, d, g. *E. radicalis.* b, e, h, j. *E. gyrosa.* c, f, i, k. *E. gyrosa* var. *parasitica,* p. 367. a–c. ascospores; d–f. spores in ascus; g–i. conidial spores; j–k. isolated perithecia, k. showing mycelium from germinating ascospores within.

SPORE STAGES OF THREE AMERICAN ENDOTHIAS.

PART VI.

REPORT OF THE STATE FORESTER

WALTER O. FILLEY.

INTRODUCTION.

The Forester of the Connecticut Agricultural Experiment Station is *ex-officio* State Forester and State Forest Fire Warden. The work of the Department of Forestry may accordingly be classed under three heads.

The Station Forester works along the following lines:

1. Investigation of forest conditions, and the problems involved in the profitable management of Connecticut woodlands. This is carried out on both State and private lands.

2. Experimental work in forest planting and management. As such experiments must be carried on for a term of years to secure results of value, most of this work is on land belonging to the Station or to the State, although occasionally experiments are undertaken in coöperation with private land owners.

3. Dissemination of information regarding forestry. In accordance with the established policy of the Experiment Station, the Forestry Department aims to help woodland owners and the public in general to obtain a knowledge of forestry principles and methods. To accomplish this object, practical assistance is given to all applicants so far as possible, either by correspondence, or preferably by means of examination of land and recommendation as to treatment; news articles are prepared for the press, and publications are issued from time to time giving the results of investigations and experiments with the practical application of the lessons learned; public addresses and illustrated lectures are given before farmers' institutes, granges, and other organizations which may be interested.

The State Forester has charge of the State Forests already established, and is authorized to establish others as funds may be made available for the purpose. It is his duty to protect and to develop these State Forests by planting, and by improvement cuttings, the receipts from such cuttings being used for further improvement work.

The State Forest Fire Warden is the head of a fire warden service which includes a town fire warden in each town, and such district or deputy wardens as conditions in each town may render necessary. The forest fires extinguished by local wardens are reported by them to the State Warden accompanied by bills for services rendered or expenses incurred. Such bills, after examination as to legality, are recorded and referred back to the towns for payment on approval by the selectmen. From a study of the fire reports, facts are determined as to the causes of fires, and the best methods of preventing and extinguishing them. As the State Forest Fire Warden is responsible for the efficiency of the service and enforcement of the laws regarding forest fires, it is incumbent on him to issue such instructions and supplies as will bring about the desired results. Press bulletins and other material of an educational nature are also issued from time to time.

These various branches of the regular work of the Department are taken up in detail on the following pages, the order of their discussion being reversed for convenience in arrangement. During 1912, the forester was involved in a special line of work which is not fully covered in this report. He was *ex-officio* a member of a Special Commission on the Taxation of Woodland, authorized by the General Assembly of 1911. As secretary of this Commission he found it necessary to give considerable time to the gathering of material and preparation of a report. This report is to be presented to the General Assembly of 1913 and will form the basis for legislation on the subject of forest taxation. Copies may be obtained from the State Forester or the State Tax Commissioner.

The proposed legislation will provide a just system of taxation for all forest land in the State, but will be optional in its application. Opportunity will be offered for the classification of forest land as such, a fair valuation of the land for purposes of taxation to be established and maintained without change for a definite period of years. An annual tax on this valuation of the land alone will be provided for in addition to a yield tax on the timber when cut. Such a law will be an encouragement to investors in forest lands, for it will make it possible to determine definitely the amount of taxes chargeable against such an investment in future years. This will remove one of the factors which has interfered with the progress of forestry work in this State, since uncertainty regarding taxation is a heavy handicap to a long time investment.

The first Station Forester, appointed April 1, 1901, was Walter Mulford, F.E., Cornell. He was appointed State Forester, July 1, 1901. On July 1, 1904, he was succeeded by Austin F. Hawes, M.F., Yale. By act of the General Assembly he also became State Forest Fire Warden in July 1905. He resigned April 1, 1909, and Samuel N. Spring, M.F., Yale, was appointed State Forester on October 1, 1909. Having served for two years as Assistant in Forestry, the writer was appointed Assistant State Forester, October 1, 1911, in accordance with an act of the General Assembly providing for such an office. Mr. Spring resigned October 1, 1912, and the writer was appointed his successor. Mr. A. E. Moss, M.F., Yale, was appointed as Assistant in Forestry from that date.

This report for 1912 is intended to sum up the work of the Forestry Department in all lines since its establishment. The policy of the present Forester will be in accordance with that of his predecessors, but he will have the advantage of building on the foundations they have laid and should therefore be able to show a distinct advance in the forestry work of the State during the next few years.

FOREST FIRES.

The report of the Forester for 1910 was largely devoted to this subject, and discussed fully the results of the Fire Warden work for the years 1905-1910. Especial attention was given to the figures for 1910, because the conditions in that year were such that a large number of fires (834) occurred, and it seemed probable that this would prove to be a maximum record which would not be equalled in succeeding years.

TABLE I.—NUMBER OF FOREST FIRES BY MONTHS.

Year.	Total Number.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.......	834	0	0	285	305	45	2	9	0	6	141	41	0
1911.......	978	5	0	66	425	390	13	20	25	1	10	21	2
1912.......	526	1	3	27	109	90	34	53	5	3	142	38	21

By reference to Table I, it will be seen that this expectation was unfulfilled. The conditions in 1911 were worse than in 1910, especially during the months of April and May, when 815 fires occurred. Although the warden service was more efficient and more vigilant than ever before, a total of 978 fires was reported with damage, cost, etc. as given in Table II.

TABLE II.—SUMMARY OF FOREST FIRES, 1911.

County.	Total number.	Causes.							Acres burned.	Estimated damage to standing timber.	Estimated damage to forest products and buildings.	Cost of fighting.	Cost of protection.
		Unknown.	Railroad.	Careless.	Burning Brush.	Incendiary.	Fireworks.	Lightning.					
Fairfield.....	147	69	38	18	20	2	..	..	5,376	$11,585.50	$ 637.00	$1,684.35	$201.13
Hartford.....	207	90	69	25	19	4	..	..	13,550	67,982.00	13,420.00	3,784.54	309.37
Litchfield.....	162	49	69	18	22	4	..	..	14,604	41,302.00	3,444.50	2,616.29	111.94
Middlesex...	69	24	29	6	9	1	..	..	6,128	26,389.00	1,449.00	714.63	36.43
New Haven..	143	69	40	18	16	..	..	..	7,073	30,008.00	2,492.00	1,693.04	29.43
New London.	73	52	6	8	6	1	..	..	8,074	20,660.00	1,105.00	1,079.76	17.41
Tolland......	78	27	26	14	11	..	..	..	4,697	25,613.50	16,427.00	1,605.50	14.65
Windham.....	99	36	42	10	5	5	..	1	5,496	30,475.00	2,610.50	1,803.39	45.52
Totals.....	978	416	319	117	108	17	..	1	64,998	$254,015.00	$41,585.00	$14,981.50	$765.94

Conditions in 1912 were very much better, particularly during the spring, when most fires occur in a normal season. Rains during the previous fall and abundant snows during the winter had matted down the leaves, and the rainfall during the first five months was more than six inches in excess of the normal. Consequently very few fires occurred and few of those reported caused large damage. After June first, conditions changed greatly and but one half inch of rain fell during the month. The precipitation was considerably below normal in each succeeding month until December. During the summer and early fall, fires were frequent and exceedingly difficult to put out owing to the dryness of the soil. Many fires burned underground for a week or more, covering only a few acres in each case, but requiring constant watching to prevent their getting beyond control.

Table III gives the complete record for 1912. In comparison with previous years it shows a less number of fires (526) than 1910 and 1911, and less area burned over than in those two years, as well as in 1908, when the number of fires reported was but little over one-half as large. (See Table IV.) The cost of fighting also shows a considerable decrease over the two previous years both in gross and per fire. This cost would have been much smaller had it not been for a few summer fires which burned for several days. Although weather conditions must be given much credit for the good record of 1912, the activity and efficiency of the wardens should not be underestimated. Their vigilance prevented many small fires from becoming serious. On the whole, there is plenty of evidence that the fire warden service is more active and efficient each year, and it is evident that with a few exceptions, the towns of the State are realizing the necessity for extinguishing fires promptly.

TABLE III.—SUMMARY OF FOREST FIRES, 1912.

County.	Total Number.	Causes.							Acres burned.	Estimated damage to standing timber.	Estimated damage to forest products and buildings.	Cost of fighting.	Cost of protection.
		Unknown.	Railroad.	Careless.	Burning brush.	Incendiary.	Fireworks.	Lightning.					
Fairfield	44	17	20	5	1	1	...	...	832	$ 1,786.00	$ 107.00	$ 143.28	$204.49
Hartford....	129	44	44	26	9	2	1	3	5,088	21,572.00	5,377.24	2,011.20	151.53
Litchfield ..	87	28	35	13	7	...	3	1	2,344	6,286.00	396.00	1,142.88	182.81
Middlesex..	41	18	14	7	2	...	...	...	1,924	6,617.00	50.00	261.20	96.32
New Haven.	82	39	10	22	2	5	3	1	868	2,878.00	681.00	653.38	78.93
New London	35	13	3	18	1	...	...	...	1,878	7,565.00	51.00	468.91	36.64
Tolland.....	43	12	16	13	2	...	...	...	738	2,494.00	4,377.50	486.99	21.84
Windham ...	65	22	31	7	2	3	...	...	1,943	6,834.00	145.00	499.80	21.87
Totals ..	526	193	173	111	26	11	7	5	15,615	$56,032.00	$11,184.74	$5,667.64	$794.43

Prompt action by wardens means smaller damage as well as less expense to the towns and State. Wardens, however, cannot be expected to neglect their other business to watch for fires, no matter how public-spirited they may be. It is therefore very desirable that assistance in locating fires be rendered the wardens in every way possible. For this purpose, the U. S. Post Office Department has instructed rural mail carriers to report to the nearest warden as soon as possible, any fires they may see in covering their routes. This should prove of great assistance in Connecticut, as most of the forested area is covered by carriers once each day.

TABLE IV.—SUMMARY OF FOREST FIRES, 1905–1912.

Year.	Number of wardens.	*Number of towns not reporting.	Number of fires reported.	Area burned. (Acres.)	Average area per fire. (Acres.)	Cost of fighting.	Average cost per fire.
1905	44	126	...	†8,000	....	....	.....
1906	119	94	125	4,036	32.3	....	.....
1907	140	76	109	4,387	40.2	$1,286.46	$11.80
1908	152	64	283	18,430	65.1	3,646.66	12.88
1909	157	18	339	14,779	43.6	2,755.46	8.13
1910	160	19	834	47,443	56.9	10,024.76	12.02
1911	163	9	978	64,998	66.5	14,981.50	15.32
1912	168	28	526	15,615	29.7	5,667.64	10.77

* Includes nine principal cities whose limits are coterminous with those of the town.

† Estimated at the end of the year.

It also seems desirable to establish lookout stations on a few high points in the State from which observers may watch for smoke of forest fires during the danger seasons. If the stations are equipped with telephones, the observers will be able to locate fires definitely and inform the nearest wardens at once. Two stations were maintained experimentally during 1912 with valuable results, even though the favorable season made their value less apparent than it would have been the previous year. If possible, other stations will be established during 1913, the State coöperating with towns and land owners when practicable.

Under the so-called Weeks Law, which provided for National Forests in the White Mountain and Appalachian regions, the Federal Congress authorized the U. S. Forest Service to coöperate with the various states in protecting from fire the forested watersheds of navigable streams. Federal funds were thus made available for use in paying for the services of observers at lookout stations in northern Connecticut. This arrangement will be continued in 1913.

Past years have shown that a large proportion of the fires in this State are due to sparks from railroad engines. During the spring of 1912, when fires were few on account of plentiful rains, forty-one per cent. of the fires reported by wardens were attributed to this cause. In 1911, when fires from all causes were more frequent, only thirty-five per cent. were reported as railroad fires. Believing the value of patrols should be demonstrated with a view to securing future coöperation with the railroad companies in such work, ten patrols were maintained during the danger season along stretches of track where fires are of common occurrence. These patrols were paid by the Federal government under the coöperative arrangements mentioned above. They reported extinguishing 270 small fires during the year. These were in addition to the number reported by wardens (172), and many of them would probably have become serious had they not received such prompt attention. With the figures thus obtained as a basis, plans for patrol work will be submitted to the railroad companies, with the expectation that they will do such work where needed in 1913.

Chapter 114, Public Acts of 1911 provided that all bills for extinguishing fires due to railroad causes should be paid by the company responsible. Under this law, bills amounting to over $600 were paid during 1912. Had the law been in effect in the spring of 1911, the fire bills to railroad companies would have undoubtedly shown a larger total, and the cost of fire fighting to the towns and State would have been correspondingly reduced. If the money spent in this way and in settling damage claims were used in patrol work and other preventive measures, the resources of the community would suffer less damage from fire.

In the future more attention must be given to measures of prevention calculated to eliminate, so far as possible, the more easily determined causes of forest fires. The railroad fire problem is the most obvious, and its solution should be easy provided the railroad companies will coöperate with the State. Other causes must be eliminated largely by educational measures which will arouse the general public to a sense of its responsibility regarding forest fires. Enforcement of the laws providing penalties for carelessness with fire will help greatly by furnishing a few object lessons. Much can also be done in the public schools and through the press to emphasize the need for care in handling matches, cigars, etc. when in the woods. To emphasize the need of such work, the following analysis is given of 137 fires reported during 1912 as due to carelessness on the part of individuals:

Auto party	1	Matches	5
Burning brush	26	Smokers	25
Children	6	Strollers	2
Fishermen	4	Not given	21
Hunters	47		

It is evident that most of these fires were due to carelessness in handling matches, throwing down cigar butts, etc., or leaving fires unextinguished. It also seems reasonable to believe that very few of the people responsible for such fires would have intentionally set them, since their presence in the woodland would indicate that they enjoyed the natural conditions found there. Hence the belief that the public can be educated to the need for greater care to preserve such conditions from destruction by fire.

STATE FORESTS.

With the appointment of a State Forester in 1901, Connecticut adopted the policy of acquiring land for State Forests. The value of land which might be purchased was limited by law to four dollars per acre, and no specific appropriation was made for the purpose until 1909. From the biennial appropriations of $2,000 each which were provided to cover the expenses of the State Forester, including travelling, taxes, protection, planting and other expenses incident to the administration of the State Forests, a total of 1,512 acres of land was purchased previous to 1909 at an average price of $2.10 per acre. This increasing area caused greater expense of administration with consequent reduction in amount available for purchase. Increasing difficulty was also met with in securing desirable lands at prices within the specified limit of four dollars per acre.

The General Assembly of 1909, therefore, made an appropriation of $5,000, to be available until expended, for the purchase of land suitable for State Forests, and in 1911 the maximum purchase price of such land was increased to eight dollars per acre. This limit gives a better opportunity to secure desirable tracts of land which would otherwise be unavailable on account of price. In most cases the cheaper lands are located so far from the railroad that it is not only difficult to market the timber products but they are not sufficiently accessible to visitors to render them of the greatest value as State Forests.

The purpose of such forests in this State is two-fold. First, they should be demonstration areas where the application of forestry principles to local conditions may be shown to woodland owners and experiments in afforestation and management may be carried on for a long period. Second, they should be reserves for the growth of large timber, since the State is much better able than private owners to carry such long term investments. Thus they may be considered a source of future profit to the State, as well as a source of future supply of large timber for local uses.

Since conditions vary considerably in different parts of the State, it is desirable that the demonstration areas be located in different regions so as to include these various conditions. The location of a State Forest in each county would assure this result. It has therefore seemed best to acquire contiguous areas which could be thrown together and managed as one large tract in each county, rather than a number of widely separated small tracts which could not be combined to advantage. Two thousand acres of woodland can be more economically managed than five hundred or one thousand acres. So far, however, it has not been practicable to acquire a tract of two thousand acres in one piece, although this has been the aim of each State Forester.

The Portland State Forest, in the towns of Portland and Chatham, now contains approximately 1,100 acres of land, bought at an average price of $1.90 per acre. Most of this land had timber growth of some sort, and much of this was of sufficient size to permit improvement cuttings or thinnings. The products of such thinnings were disposed of to the best advantage as railroad ties, posts, or cordwood. On account of the distance from market, no profit has been made on the cordwood from thinnings and the best returns have been obtained by selling it to local charcoal burners. Approximately 125 acres have thus been thinned, the wood removed paying in part for the work done and the remaining stand being left in better condition.

During the past two years damage from the chestnut bark disease has become more apparent in the State Forest, and experiments have been started to determine the practicability of checking the progress of the disease on a definite area by removing all infected trees. No definite results have as yet been obtained, except that it is evidently impossible to locate all the diseased trees without going over the ground more than once. This subject will be more fully discussed in the report of the Botanist (Part V).

Some portions of this Forest had been so severely culled before purchase by the State that very little growth of value remained. One such area of about 15 acres was cleared and planted with pine in the spring of 1912. Another tract with a good growth of chestnut sprouts large enough for small poles, was damaged by fire in 1908. Following the fire most of the trees became infected with blight to such an extent that the timber was sold to a lumberman. The best of it has already been removed, and after the cordwood is cleaned off the area will probably be planted to pine. Adjoining areas of cutover land will be added to the Forest whenever they can be advantageously purchased, and will be planted with coniferous trees in most cases.

A total area of about 30 acres has already been planted with white pine, red pine and Norway spruce, and other land will doubtless be so planted each year. Only the more valuable and more rapid growing stands of hardwoods will be maintained as such, the poorer quality and slower growing stands being transformed into a more profitable coniferous type as rapidly as possible. These will permit of more intensive management, since the more valuable prospective yield will warrant a larger expenditure in protection and management.

To carry out this work systematically, a working plan for a short term of years is desirable. Most of the necessary data was gathered during 1912 and the publication of such a plan as a Station Bulletin is anticipated during the coming year. It will include a type and stock map of the Portland State Forest showing the present stand with recommendations as to future treatment.

The Union State Forest is a tract of 288 acres in the town of Union purchased in 1905. Much of it was open farm land of rather poor quality, and was purchased at an average price of a little over $3 per acre. As there was practically no timber of value on the area, no improvement cuttings have been made but considerable planting has been done on the open land. In all, about 55 acres were planted with white pine, and two small areas of about 2½ acres each were planted with Scotch pine and European larch respectively. In the spring of 1912, failures in all the plantations were filled with two-year Scotch pine seedlings, making an irregular mixture of white pine and Scotch pine throughout most of the planted area. Scotch pine was used for this purpose because its more vigorous growth would give it a chance to overtake the already established white pine. As this tract is situated in a pine region, it is particularly desirable that a good stand of pine be established. Considerable work has been necessary in checking the white pine weevil during the past two seasons. The mixture of Scotch pine with the white pine should tend to reduce the damage from this cause, as the weevil does not thrive in the former species.

The Simsbury State Forest consists of 130 acres of brush and cut-over land which had been considerably damaged by fire before purchase by the State in 1908. As the tract is crossed by a railroad, a good opportunity was presented to practice protection from fire, and with the exception of one fire in 1910, this has been successful. Twenty acres have been planted with Scotch pine, twenty-two acres with white pine and three acres or more with red pine, European larch and Japanese red pine. It is intended to extend these plantations from year to year until the entire tract is growing pine instead of the present growth of poor quality hardwoods. The soil is rather light and sandy throughout most of the area, and should be well suited for the growth of pine. Fire lines have been cleared along the railroad track and across the tract so as to make protection from fire practicable. This forest is accessibly located and as a demonstration area has decided advantages, but it is not large enough to be economically managed, and it is hoped that more land may be acquired before many years.

THE STATION FORESTER.

It has already been stated that the work of the Station Forester follows three lines; investigation, experiment and dissemination of information. These lines are closely associated and often overlap. In many cases, an investigation involves experiments, and experiments may require preliminary investigation. The publication of results, in either case, is an educational measure intended to increase the knowledge of forestry methods and an interest in their practical application, as a means of obtaining improved forest conditions and increased forest values.

The improvement of the present forest so as to secure its maximum yield, and the increase of the forest resources of the State by more intensive use of land suitable only for forest growth, are two distinct problems, although they have much in common. In the greater part of the State, the present forest consists of second growth hardwoods with a large percentage of chestnut, either in pure stands or mixed with other species. These chestnut stands have been considered a source of profit to their owners in the past, and because of their ability to renew themselves by sprouts and to grow rapidly on good sites, have been cut clean at intervals of from twenty to forty years. For several generations the market for railroad ties, telephone poles and other products for which chestnut is adapted, has been very good, and no other hardwood tree has been such a source of revenue to the Connecticut farmer. Because of its greater sprouting ability and more rapid growth it seems probable that chestnut has increased in quantity in the State during the past fifty years as compared with other hardwood species which formerly grew in mixture with it.

Other factors have been at work during recent years, however, which bid fair to rob the chestnut of its supremacy as a favorite timber tree. The cutting of successive generations of sprouts with practically no regeneration by seed has inevitably resulted in a less vigorous and shorter-lived stand. In many cases, failure of some stumps to sprout, or the destruction of some sprouts by drought, winter-killing or fire has produced a more open stand, or given a chance for light-seeded weed trees like poplar or birch to become a part of the stand. Thus many stands of chestnut have gradually deteriorated until to-day they are not producing half a cord per acre of valuable wood per year.

Fire has had a great deal to do with this deterioration, for chestnut is thin-barked and not fire-resistant like most oaks. It is therefore more easily damaged, and even surface fires will sometimes completely destroy stands of chestnut sprouts big enough for posts. Older and heavier barked trees are often so seriously damaged that large patches of bark are killed and loosen up for several feet above the base of the tree in time. A second fire finds easy access to the wood itself, and even though no second fire occurs, the loosened bark gives a chance for insects and fungi to enter the wood, so that decay at the base of the tree is almost sure to follow fire. The roots are often injured also and a decrease in vitality follows, so that when the tree is cut, it not only proves to be unsound, but is lacking in sprouting ability. Occasionally fire scars heal over so that they are not apparent on the outside, but this is less apt to happen with chestnut than with oak, and even a scar which has completely healed is a detriment to the quality of the log in which it occurs.

Improvement of the present forest to secure its maximum yield involves protection from further damage by fire. This is so evidently essential that its need will not be further emphasized here. Something besides protection from fire is necessary, however, if the maximum yield is to be secured from any stand of forest trees. Improvement thinnings should be made from time to time to remove, 1st, weakened and suppressed trees which can never produce first-class material and will probably succumb to competition anyway; 2d, trees of inferior species which if left will not only interfere with the growth of better individuals but tend to increase the quantity of inferior material in the stand; 3d, crooked or damaged trees which, while preventing the best development of other trees, will never be worth much themselves. Such thinnings not only prevent much waste of material, but if properly made with due regard to maintenance of the crown cover, hasten the maximum development of the most valuable trees in the stand.

Thinnings are as essential to the production of a timber crop as thinning and weeding are to the production of a crop of beets or onions. Theoretically, thinnings should be made in a wood lot just as soon as the trees begin to crowd each other, but in practice it is customary to wait until the products of a thinning will approximately pay its cost. Later thinnings yielding larger material may show a profit, but an increased final yield would warrant such cultural operations in most cases, even though at some expense.

Cuttings are sometimes necessary for the express purpose of removing trees injured by fire, wind, drought, insects or fungi in order that the damaged material may be utilized, and in the case of insects and fungi, that further damage may be prevented if possible. Such damage cuttings are usually only of local importance, and confined to a small area, but occasionally the ravages of an insect pest or a fungous trouble may affect a considerable territory, and destroy a large part of its forests.

Just at present chestnut in this region is suffering from a fungous trouble (the so-called chestnut bark disease or blight) which has already killed a large proportion of the chestnut trees in south-western Connecticut and is known to exist all over the State (see Botanist's Report). As the fungus is a parasite which cannot be very successfully treated with a fungicide, and as it spreads by means of spores probably carried by the wind and insects, the only way of checking it seems to be by the complete destruction of the diseased trees, which may be sources of infection. The expense of this operation would render it impractical in stands not yet of merchantable size where diseased trees are abundant. The removal of isolated infected trees would probably tend to check the spread of the disease, but since it is impossible to detect the presence of the disease when the infection first takes place, it is difficult to eliminate the trouble even by such radical methods.

If the spread of the disease has been assisted by a weakened condition of the chestnut trees due to the abnormal climatic conditions of the past ten years, and which have produced winter and drought injuries in many trees, it seems reasonable to believe that a return of normal conditions would be followed by a decrease in the spread of the trouble. As is stated in the Botanist's Report (q. v.), there is some reason to believe that such a decrease is already becoming apparent. It is not to be expected that trees already infected will be able to throw off the disease and entirely recover from it (although some instances have been noted where scars of blight cankers have partially healed), but if the disease gradually dies out as a result of natural causes, it is possible that chestnut stands will be more or less completely renewed by sprout and seedling growth free from disease.

The fact must be recognized, however, that many formerly thrifty chestnut stands have been completely destroyed and that at best only a partial natural regeneration of diseased stands can be anticipated for many years. If, then, land which has grown chestnut timber profitably in the past is to be continued as forest land, immediate measures should be taken to secure the quickest and best results. It is merely a common sense precaution on the part of the community as well as that of the owner, to make sure that land which has been the source of revenue in the past shall continue to yield at least an equal revenue in the future. From a business point of view, it is equally sensible to consider the possibility of increasing this revenue by growing the kind of timber which will produce the largest value in the shortest time.

If chestnut is the most profitable timber which can be grown where chestnut formerly grew, a fully stocked stand of this species should be established, by planting if necessary, just as soon as there is reasonable assurance of safety from the chestnut blight. If some other species than chestnut will produce quicker returns or larger profits, a considerable investment in planting such species might be warranted. Such an investment would certainly prove more profitable than to allow land formerly bearing chestnut to lie idle, or to allow it to seed up with species of small value like birch and poplar, or slow-growing species like black oak and hemlock. Even though chestnut were entirely free from disease at the present time, there are many situations where some species other than chestnut would produce better results. For instance, there are many ridges in Connecticut where chestnut does not grow to more than cordwood size in forty years. Unless very favorably situated with regard to market, such timber cannot be handled at a reasonable profit, and with a long haul to market, no profit can be anticipated. This is also true of many oak and mixed hardwood stands growing on poor soils. After cutting such timber, its replacement with a plantation of rapid growing conifers such as white pine or Scotch pine, would promise much greater returns than could be secured from natural regeneration. The greater value of the resulting product and the shorter period necessary to produce it, would render the investment involved worth while.

Much land in Connecticut best suited for forest growth is now practically non-productive as the result of fires. Much other land formerly used for grazing or cultivation, but now reverting to forest on account of changed economic conditions, may be considered as idle land for the time being, since the present timber growth is of poor species or is too scattered to produce valuable material. All such non-productive and idle land which is better suited for forest growth than any other purpose should be made use of for forest planting with the species best adapted to the situation. This policy if systematically carried out, and followed up with intensive methods of forest management, will not only increase the productiveness of Connecticut forest lands, but will furnish many Connecticut industries with raw material which is now brought in from other states.*

With a view to advising land owners regarding the best methods of handling their forest lands, or regarding the afforestation of idle lands, the Station authorizes its foresters to make examinations without charge other than the necessary expenses for transportation, etc. Reports of such examinations give a statement of the condition of the forest land examined, and recommend a general plan for its future management. So far as possible, practical demonstrations and instructions are given for the work involved, but direct supervision cannot be furnished, nor can estimates of standing timber be made for the purpose of sale or purchase. This work rightly belongs to foresters outside the employ of the State, and such men will be recommended when desired. During the past few years the Station has supplied stock for forest planting at cost in order to encourage such work, but the development of commercial nurseries for the production of such stock at a reasonable price will relieve the Station of this necessity after the present season. The time required in attending to the nursery work and shipment of trees can be better spent in carrying on other work of the department. Assistance in securing such stock will be cheerfully rendered, however, and every effort will be made to assure satisfactory results.

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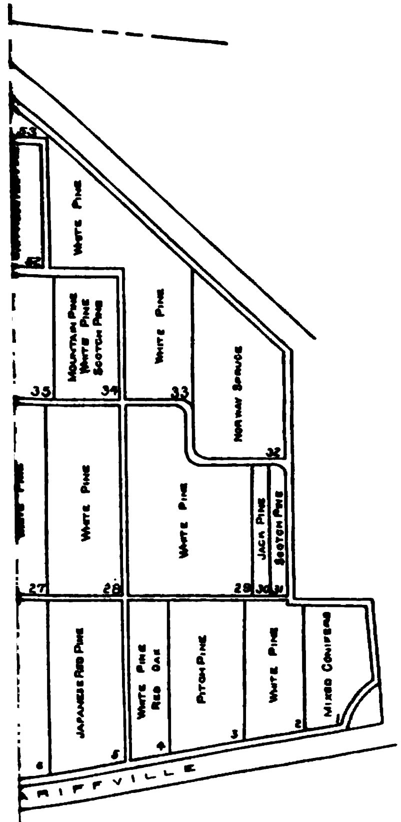
* See Bulletin 174.

PLANTATIONS

XPERIMENT STATION

Windsor Conn.



RAINBOW FOREST PLANTATIONS.

Since 1902 the Connecticut Agricultural Experiment Station has conducted experiments in forest planting on a tract of land at Rainbow in the northern part of the town of Windsor. This land is part of a natural sand plain and represents one type of non-agricultural land in the state better suited for forest growing than anything else. The soil is very sandy, poor in quality and loses moisture rapidly in periods of drought.

The tract may be reached by electric car marked "Rainbow" from Hartford via Windsor. The plantations lie about one-half mile west of the village of Rainbow, between the Tariffville and East Granby highways near their junction. Mr. Henry Palmer, who lives near the Rainbow postoffice, is local superintendent and will gladly conduct visitors through the plantations.

The following descriptions of experimental plots and the accompanying map have been prepared as a guide to those who wish to examine the plantations. The knowledge thus far gained from these experiments has been included with the data from private planting in preceding pages of this report. It is anticipated that the results secured from these plantations by intensive management will prove of considerable interest and value. They will be published in future reports and bulletins of this Station.

DESCRIPTION OF EXPERIMENTAL PLOTS.

*Plot No. 1. Austrian pine, Scotch pine, European larch, Douglas fir, Chinese arbor-vitæ. Area about 1 acre. Spring 1907, east side, Austrian pine, 2-year seedlings, spacing 5 x 5 feet; middle, European larch, 2-year seedlings, spacing 5 x 6 feet; west side, Scotch pine, 2-year seedlings, spacing 5 x 5 and 6 x 6 feet. Spring 1911, area partially burned over, destroying some of each species. Spring 1913, burned area planted with 7-year Douglas

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* Partially destroyed by fire in 1911.

fir transplants and 6-year Chinese arbor-vitæ seedlings. This plot will show the comparative growth of several exotic conifers on poor soil.

***Plot No. 2.** White pine. Area .9 acre. Spring 1907, experiment to determine comparative results of different spacing. 6 x 6 feet, 5 x 5 feet, 4 x 4 feet, 3 x 3 feet. Spring 1913, trees destroyed by fire replaced with 8-year white pine transplants.

Plot No. 3. Pitch pine. Area 1.3 acres. Spring 1902, seed sown on cultivated strips 1½ feet broad and 4 feet apart. South half of plot at rate of 2 pounds per acre, north half at rate of 1 pound per acre. Seed lightly covered by brushing the surface in both cases. Result shows that a stand of this species may be successfully established in this manner. Two pounds of seed per acre gives too dense a stand; 1½ pounds would be sufficient. Losses have not exceeded five per cent. Pitch pine is of very little commercial value in this region, however.

Plot No. 4. Red oak and white pine. Area .8 acre. Spring 1904, solid rows of oak alternating with oak and pine; spacing 6 x 6 feet. Oak secured by seedspot method, three acorns to a spot. 2-year white pine seedlings used. Loss small for first three years; since then oaks have been kept cut back to ground by rabbits with a few exceptions. Pines bushy and poorly formed, due to lack of crowding and attacks of white pine weevil. This mixture does not appear to be a practical one since pine grows faster and is a better tree for a sandy site than red oak. If used on such sites, oak should be given several years start.

Plot No. 5. Japanese red pine. Area 1.5 acres. Spring 1910, 2-year seedlings, spacing 6 x 6 feet. Failures nearly 50 per cent. the first season. Spring 1911, blanks filled with 3-year transplants. Heavy loss due to drought, following both plantings. Living stock is thrifty. Spring 1913, blanks filled with 4-year white pine transplants.

Plot No. 6. Western yellow (bull) pine. Area 2.5 acres. Spring 1908, 2-year seedlings, spacing 5 x 5 feet. Loss approximately 45 per cent., due to drought and fungous disease (*Peridermium pyriforme*). This is a Western species which seems to adapt itself poorly to dry sandy soils in Connecticut, grows slowly and sustains much loss from drought. 1912, average height 1.1 feet, maximum 2 feet. Spring 1912 and 1913, blanks filled with 4-year white pine transplants.

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* Partially destroyed by fire in 1911.

Plot No. 7. Chestnut. Area 2.4 acres. 1902-1903, spring and fall seeding and spring planting. 1912, 10 to 15 per cent. living. Trees scattered and range in height from 2 to 4 feet. Individual development poor. The plantation is practically a failure and will be replanted.

Plot No. 8. Chestnut. Area 2.3 acres. Spring 1903, 1-year seedlings, spacing 5 x 5 feet, 6 x 6 feet, 7 x 7 feet, in three parts from south to north. Losses large and many trees show drought and winter injury. Results unsatisfactory. A few groups show fair development, individuals ranging from 3 to 5 feet in height.

Plot No. 9. Natural growth of hardwoods. Area .6 acre.

Plot No. 10. Chestnut sprouts. Area .6 acre. Natural growth, 50 to 60 years old. Trees damaged by fire and other causes were removed in 1912.

Plot No. 11. Gray birch and white pine. Area .7 acre. Scattered natural white pine reproduction underneath birch.

Plot No. 12. White pine. Area .5 acre. Spring 1902, 3-year seedlings planted under gray birch. 15 to 20 feet tall, spacing 5 x 5 feet. 1903, blanks filled with 3-year transplants of same species. Little subsequent loss and little injury by white pine weevil. 1910, birch removed from north half. 1911, birch removed from south half. Slow growth during first ten years resulted from the shade.

Plot No. 13. Natural growth of pitch pine and hardwoods. Area 1.2 acres. Spring 1910, balsam fir transplants set irregularly under pitch pine. Fir shows very little growth in three years.

Plot No. 14. Scotch pine. Area 1.2 acres. Spring 1907, 2-year seedlings planted in furrows ploughed through brush, spacing 5 x 6 feet. 1910, brush cleaned from part of plot so as to free Scotch pine. 1913, balance of plot cleaned.

Plot No. 15. White pine. Area 1 acre. Spring 1906, 3-year seedlings, spacing 5 x 6 feet. 1912, shows 10 per cent. loss; remaining trees thrifty. 1913, brush cleaned from plot.

Plot No. 16. Not planted. Area 3.7 acres.

Plot No. 17. Nursery site. Not planted. Area 1 acre.

Plot No. 18. Natural growth of pitch pine. Area .8 acre.

Plot No. 19. Japanese red pine. Area 1.2 acres. Spring 1910, red pine 2-year seedlings, spacing 6 x 6 feet. 50 per cent. loss the first year. May 1911, blanks filled with 3-year transplants of same species. Heavy loss the following season, due to drought as in the previous year.

Plot No. 20. White pine and Scotch pine. Area 1.5 acres. Spring 1910, 4-year white pine transplants and 2-year Scotch pine seedlings in alternate rows, spacing 5 x 5 feet, to replace hardwood trees of the previous experiment, some of which remain but were disregarded in replanting as they have grown very slowly. Some older white pines remain from planting of 1904. Loss heavy in Scotch pine as result of subsequent drought and use of slender stock grown too densely in seedbeds.

Plot No. 21. White pine and Scotch pine. Area 1.5 acres. Spring 1910, same planting as No. 20 and similar conditions.

Plot No. 22. Red pine. Area .9 acre. Spring 1902, 4-year transplants, spacing 4½ x 5 feet. Example of a practically perfect plantation. (Should be compared with other species planted the same year, Plots 23, 24, 25.) On north end of this plot white pine was used in place of red pine.

Plot No. 23. Scotch pine. Area .6 acre. Spring 1902, 3-year seedlings, spacing 4 x 5 feet. 1904, blanks and narrow space on north end filled with 2-year Scotch pine transplants. Example of practically perfect plantation. (Should be compared with other species planted same year, Plots 22, 24, 25.) 1911, trees closed together, grass shaded out and lower branches beginning to die as a result of dense shade.

Plot No. 24. Red pine and Austrian pine. Area .5 acre. Spring 1902, 4-year seedlings of red pine, spacing 4½ x 5 feet. July 1902, 4-year seedlings Austrian pine were planted on south end of plot with the same spacing. 1911, height of red pine on this plot averaged 2 feet more than on Plot 22; probably due to more protected position, better soil conditions or both. Spring 1905, north end of plot filled out with white pine.

Plot No. 25. White pine. Area .8 acre. Spring 1902, wild seedlings 8 to 18 inches tall, spacing 4½ x 5½ feet. 1903, blanks filled with white ash, green ash, basswood and tulip seedlings. 1904-1905, blanks filled with white pine wild seedlings. 1911, most of hardwoods had disappeared, stand is irregular and lacks uniformity of growth as a result of difference in quality of stock, replacing of failures several years after original planting and damage by white pine weevil.

Plot No. 26. White pine. Area 1.2 acres. Spring 1903, 2-year transplants, spacing 4 x 4 feet, 5 x 5 feet, 6 x 6 feet. Divided in three parts to determine the effect of different spacing. 1911, the closest spacing at north end apparently produced best height growth; considerable injury by white pine weevil, however, made it impossible to determine this fact absolutely by measurement of heights.

Plot No. 27. White pine. Area 1 acre. Spring 1904, two rows of pine alternating with two rows of chestnut 1-year seedlings, spacing 5 x 5 feet. Chestnut was a complete failure. 1910, failed rows filled with 4-year white pine transplants to determine possibility of using younger stock of same species for filling in established plantation.

Plot No. 28. White pine. Area 1.6 acres. Spring 1902, 3 and 4-year seedlings and transplants, spacing 4 x 5 feet. North end cultivated and fertilized for several seasons, resulting in some apparent increase in height growth. Severe injury by white pine weevil has prevented definite determination of this fact.

Plot No. 29. White pine. Area 2.3 acres. Fall 1907, 3-year transplants, spacing 5 x 5 feet. A test of fall planting. Result is a practically complete plantation, indicating that under favorable weather conditions early fall planting may succeed as well as spring planting on sandy soil.

Plot No. 30. Jack pine. Area .25 acre. Spring 1908, seedlings from Michigan, 1-2 feet tall, spacing 5 x 5 feet. Trees have grown very slowly. Species probably of small importance for eastern planting, although native to sand plains in Lake States.

Plot No. 31. Scotch pine. Area .3 acre. Spring 1904, 2-year seedlings, spacing 5 x 5 feet. In every other row, the alternate plants were green ash 1-year seedlings which subsequently died, leaving the pines 10 feet apart in the alternate rows. These blanks have been left unfilled in order to determine the effect of this wide and uneven spacing on the development of Scotch pine.

Plot No. 32. Norway spruce. Area 1.5 acres. Spring 1905. 2-year seedlings, spacing 5 x 5 feet under an open growth of pitch pine. Ground had been burned over just previous to planting. Fall 1907, another fire burned over a portion of the area. Spring 1910, part of the blanks filled with 4-year transplants Norway spruce. 1911, trees alive on 50 per cent. of the area but showed poor development, especially under dense shade. 1913, overwood partly removed so as to give Norway spruce more light, and blanks filled with 7-year transplants.

Plot No. 33. White pine. Area 1.5 acres. Spring 1905. 2-year seedlings, spacing 5 x 5 feet, under pitch pine giving medium shade. The trees are not well developed on account of shade but uninjured by white pine weevil. 1913, pitch pine thinned to give white pine more light.

Plot No. 34. Scotch pine, white pine and mountain pine. Area 1 acre. Spring 1911, 4-year transplants of Scotch pine and 3-year seedlings of mountain pine planted in. alternate rows. spacing 6 x 6 feet. A large per cent. of the latter died from effect of drought the same season. Spring 1913, failures filled with 5-year white pine transplants.

Plot No. 35. White pine and Scotch pine. Area 2.3 acres. Spring 1903, original planting, 2-year white pine transplants in groups mixed with hardwood seedlings, spacing 4½ x 5 feet. Spring 1904, failures in white pine filled with 3-year transplants. Spring 1911, hardwoods mostly dead; replaced with 3-year Sootch pine transplants to determine whether the Scotch pine would overtake the older white pine.

Plot No. 36. White pine and Scotch pine. Area 1 acre. Spring 1903, original planting, 2-year white pine transplants in mixture with hard maple, spacing 6 x 6 feet. Solid rows of maple, maple and pine alternating in every other row. Maple was a complete failure. Spring 1908, blanks filled with 2 and 3-year Scotch pine seedlings. Rapid growing Scotch pine should be able to catch up with white pine and form good mixed forest.

Plot No. 37. White pine and Scotch pine. Area 1 acre. Spring 1903, original planting same as Plot 36. Spring 1911, blanks in hardwoods filled with 3-year Scotch pine transplants.

Plot No. 38. White pine, Douglas fir. Area .4 acre. Spring 1903, pine and fir planted on most of the plot and pine alone at the north end. Spacing is very irregular, due to failure of hardwoods planted in the original experiment; blanks not filled; plantation left for comparison of pine and fir.

Plot No. 39. White pine. Area .7 acre. Spring 1903, ash, maple and other hardwoods alternating with pine, original spacing 5 x 5 feet. Hardwoods have failed, leaving pine with present spacing of 10 x 10 feet, which will be left to demonstrate the effect of wide spacing on growth and condition of the trees.

Plot No. 40. Red oak. Area 1 acre. Spring 1903, red oak acorns planted in spots, 1 acorn in each spot, on northerly half of plot, with spacing 5 x 5 feet. On the southerly half of plot 2 acorns were planted in each spot with a spacing of 6 x 6 feet. 1904, failed places were filled. 1907, brush cleaned from entire plot. 1911, one-third of the trees showed injury by rabbits.

Plot No. 41. White pine and Norway spruce. Area .25 acre. Spring 1906, pine and spruce 2-year seedlings in alternate rows, spacing 5 x 6 feet. Most of the trees were planted under light brush and show effect of the competing growth by more slender forms. Best development secured where no brush was present.

Plot No. 42. White pine and Norway spruce. Area 2.7 acres. Spring 1906, alternate rows of pine and spruce 2-year seedlings, spacing 5 x 6 feet under a medium dense growth of birch and pitch pine on most of the area, but varying to open growth and scattered trees at north end of plot. March and April 1911, overwood removed from south half and subsequently the spruce and pine suffered considerable injury from late frost, exposure and drought. May 1911, blanks filled with 5-year white pine transplants.

Plot No. 43. White pine and Norway spruce. Area 4.25 acres. Spring 1906, same experiment as Plot 42 but overwood not removed.

Plot No. 44. White pine. Area 3.2 acres. Spring 1906, 2-year white pine seedlings alternating with hard maple, except on west side where white pine was planted pure, spacing 5 x 6 feet. Medium dense overwood of birch and pitch pine on about half of area. Most of maples failed. Spring 1910, blanks filled with 4-year white pine transplants.

Plot No. 45. Mountain pine. Area 4.5 acres. Spring 1912, 3-year transplants, spacing 6 x 6 feet. Heavy losses during subsequent dry summer. A few scattered Corsican pines are left from an unsuccessful planting of 1910.

Plot No. 46. White pine and Norway spruce. Area .7 acre. Spring 1906, pine and spruce 2-year seedlings in alternate rows, spacing 5 x 6 feet. May 1908, blanks filled with jack pine.

Plot No. 47. Douglas fir and jack pine. Area 1 acre. Spring 1903, Douglas fir and various hardwoods in an irregular mixture, spacing 5 x 5 feet. Hardwoods mostly failed. Spring 1908, blanks filled with jack pine.

Plot No. 48. Red oak and white pine. Area 1 acre. Spring 1904, oak 1-year seedlings, pine 2-year seedlings; four rows of oak and two rows of pine, spacing 6 x 6 feet. Plantation shows good growth but the red oak is too branchy and not always straight in form. 1911, pines were outstripping the oaks in growth.

Plot No. 49. Pitch pine. Area 1 acre. Spring 1903, 2-year seedlings, spacing 5 x 5 feet. 1911, 94 per cent. living.

Plot No. 50. Red oak. Area 1 acre. Spring 1904. 1-year seedlings, spacing 6 x 6 feet. 1911, 90 per cent. living but very few well developed. The site is too poor and dry. Rabbits have done much damage.

Plot No. 51. Red oak and white pine. Area 1 acre. Spring 1904, oak 1-year seedlings and pine 2-year seedlings; two rows oak, one row pine, spacing 6 x 6 feet. Growth and form of trees generally poor.

Plot No. 52. Japanese red pine and white pine. Area 1 acre. Spring 1910, 2-year seedlings of each species in alternate rows, spacing 6 x 6 feet. Losses were very heavy, the red pine being winter-killed and both species suffering severely from drought during the seasons of 1910-1912.

Plot No. 53. White pine. Area .3 acre. Spring 1905, 2-year seedlings, spacing 5 x 5 feet. Spring 1910, blanks filled with 3-year white pine transplants.

Plot No. 54. White pine and Japanese black pine. Area .9 acre. Spring 1910, white pine 3-year transplants, black pine 2-year seedlings in alternate rows, spacing 6 x 6 feet.

Plot No. 55. White pine. Area 1 acre. Spring 1903. 2-year seedlings in mixture with beech. Spacing 6 x 6 feet. 1904, failures in pine replaced with 3-year transplants. The beech is a failure and the remaining pine is too far apart for best development.

Plot No. 56. White pine and Scotch pine. Area 1 acre. Spring 1903, 2-year seedlings, pine alternating with beech and every other row solid beech. Spring 1911, the beech having failed was replaced with Scotch pine 3-year transplants.

Plot No. 57. Chestnut and beech. Area 1 acre. Spring 1903, seedlings planted alternately in rows, spacing 5 x 5 feet. 1904, failures replaced with seedling stock. 1911, some trees of each species living but poorly formed and plantation is practically a failure, the site being too poor for these species.

Plot No. 58. Black locust. Area 1 acre. Spring 1903, 1-year seedlings, spacing 4 x 4, 5 x 5, and 6 x 6 feet. Many trees were girdled and killed by rabbits. Trees on north end have grown fastest. In 1911 these ranged from 15 to 25 feet in height and 1 to 5 inches in diameter breast high. Nearly all seriously injured by the locust borer.

Plot No. 59. White pine, black birch. Area about 1.1 acres. Spring 1903, 2-year transplants, spacing 5 x 5 feet at south end of plot. Spring 1904, white pine 3-year transplants alternating with black birch nursery seedlings, spacing 5 x 5 feet on balance of plot. Black birch has failed or grown very slowly and present wide spacing of pine has resulted in poor development.

Plot No. 60. White pine. Area 2 acres. Spring 1905, 2-year seedlings and 3-year transplants, part set in furrows and part on hills between, spacing 5 x 5 feet.

Plot No. 61. White pine. Area about 2 acres. Spring 1913, 5-year transplants partly in and partly between old furrows, spacing 5 x 6 feet. A few chestnut trees left from planting of 1905 were ignored in replanting because so small and poorly developed.

Plot No. 62. White pine. Area 5.7 acres. Spring 1907, 2-year seedlings, spacing 5 x 5 feet. Very few failures.

Plot No. 63. Area 2.4 acres. Not planted.

Plot No. 64. Scotch pine. Area 1.3 acres. Spring 1910, 2-year seedlings, spacing 6 x 6 feet. A few chestnut trees remain from a previous planting.

Plot No. 65. Area .8 acre. Not planted.

Plot No. 66. Western yellow (bull) pine. Area 1.6 acres. Spring 1908, 2-year seedlings, spacing 5 x 5 feet. Conditions similar to that of Plot No. 6. Some loss from fungous trouble (*Peridermium pyriforme*).

Plot No. 67. Area .2 acre. Scattered natural growth of pitch pine.

Plot No. 68. White pine. Area 4.4 acres. Spring 1905, collected wild stock from Stafford, 2-year nursery seedlings and 3-year transplants, spacing 5 x 5 and 6 x 6 feet. Height growth varies greatly in different parts of the plot with the age, size and quality of stock, and variation in site conditions.

Plot No. 69. White pine and Norway spruce. Area 4 acres. Spring 1905, 2-year seedlings of pine alternating in each row with 2-year seedlings of spruce, spacing 5 x 5 feet. Norway spruce does not equal white pine in height growth on this sandy, dry site and suffers greater loss.

Plot No. 70. Austrian pine. Area 1 acre. Spring 1908, 2-year seedlings, spacing 6 x 6 feet. 1912, most of the trees suffered severely from drought; very few show good development.

LIST OF EXPERIMENTAL PLOTS.

Plot	1,	formerly	A1	Scotch pine, Austrian pine, European larch, Douglas fir, Chinese arborvitæ, Norway spruce, white pine, pitch pine.
"	2,	"	A2	White pine.
"	3,	"	A3	Pitch pine.
"	4,	"	A4	Red oak, white pine.
"	5,	"	A5	Japanese red pine, white pine.
"	6,	"	A6	Western yellow pine, white pine.
"	7,	"	A7	Chestnut—scattering.
"	8,	"	A8	Chestnut.
"	9,		—	Chestnut and other hardwoods—natural growth.
"	10,		—	Chestnut.
"	11,		—	Gray birch.
"	12,	"	A9	White pine.
"	13,		—	Pitch pine, balsam fir.
"	14,		—	Scotch pine.
"	15,	"	B15	White pine.
"	16,		—	Not planted.
"	17,		—	Nursery site.
"	18,		—	Pitch pine.
"	19,	"	B14	Japanese red pine.
"	20,	"	B13	White pine, Scotch pine.
"	21,	"	B12	White pine, Scotch pine.
"	22,	"	B11	Red pine.
"	23,	"	B10	Scotch pine.
"	24,	"	B9	Red pine, Austrian pine, white pine.
"	25,	"	B8	White pine.
"	26,	"	B7	White pine.
"	27,	"	B6	White pine.
"	28,	"	B5	White pine.
"	29,	"	B4 & B3	White pine.
"	30,	"	B2	Jack pine.
"	31,	"	B1	Scotch pine.
"	32,	"	BC1	Norway spruce.
"	33,	"	BC2	White pine.
"	34,	"	C1	Scotch pine, white pine, mountain pine.
"	35,	"	C2	White pine, Scotch pine.
"	36,	"	C3 (East)	White pine, Scotch pine.
"	37,	"	C3 (West)	White pine, Scotch pine.
"	38,	"	C4	White pine, Douglas fir.
"	39,	"	C5	White pine.
"	40,	"	C6	Red oak.
"	41,		—	White pine, Norway spruce.
"	42,	"	D7 (East)	White pine, Norway spruce.
"	43,	"	D7 (Center)	White pine, Norway spruce.

Plot	44,	formerly	D7 (West)	White pine.
"	45,	"	D8	Mountain pine, Corsican pine.
"	46,	"	D7	White pine, jack pine, Norway spruce.
"	47,	"	D6	Jack pine, Douglas fir.
"	48,	"	D5	White pine, red oak.
"	49,	"	D4	Pitch pine.
"	50,	"	D3	Red oak.
"	51,	"	D2	White pine, red oak.
"	52,	"	D1	Japanese red pine, white pine.
"	53,	"	DE1	White pine.
"	54,	"	DE2	Japanese black pine, white pine.
"	55,	"	E1	White pine.
"	56,	"	E2	White pine, Scotch pine.
"	57,	"	E3	Chestnut, beech.
"	58,	"	E4	Black locust.
"	59,	"	E5	White pine, black birch.
"	60,	"	E6	White pine.
"	61,	"	E7	White pine, chestnut.
"	62,	"	F5	White pine.
"	63,	"	F4	Not planted.
"	64,	"	F4	Scotch pine.
"	65,	"	F4	Not planted.
"	66,	"	F4	Western yellow pine.
"	67,		—	Pitch pine.
"	68,	"	F3	White pine.
"	69,	"	F2	White pine, Norway spruce.
"	70,	"	F1	Austrian pine.

LIST OF SPECIES USED ON EXPERIMENTAL PLOTS.

PINES.

AUSTRIAN PINE, *Pinus Laricio, var. austriaca.*

A native of Europe, where it is grown to some extent for timber; well adapted to dry, sandy soils. Plots 1, 24, 70.

BULL (WESTERN YELLOW) PINE, *Pinus ponderosa.*

A common timber tree of the western United States; usually found in dry situations. Plots 6, 66.

CORSICAN PINE, *Pinus Laricio.*

A native of southern Europe, where it attains large size, but is not hardy in New England. Plot 45.

JACK PINE, *Pinus divaricata.*

A native of Canada and the northern border of the United States; especially fond of sterile, sandy soils. Plots 30, 46, 47.

JAPANESE BLACK PINE, *Pinus Thunbergii.*

A native of China and Korea; used successfully in Japan for planting on sand plains. Plot 54.

JAPANESE RED PINE, *Pinus densiflora.*

A native of the mountains of Japan, where is grows to large size. Plots 5, 19, 52.

MOUNTAIN PINE, *Pinus montana.*

Native to the mountains of central Europe, where it does not attain large size. Plots 34, 45.

NORWAY PINE, *Pinus resinosa* (see red pine).

PITCH PINE, *Pinus rigida.*

The native yellow pine of New England, which reaches its best development further south; grows well on sandy soils, but is not of much commercial importance in this region. Plots 1, 3, 13, 18, 32, 33, 42, 43, 44, 49, 67.

RED (NORWAY) PINE, *Pinus resinosa.*

A handsome tree native to the northeastern United States and Canada; is almost entirely free from insect troubles, and has great possibilities for reforestation purposes. Plots 22, 24.

SCOTCH PINE, *Pinus sylvestris.*

The timber pine of Europe, especially well suited to dry, sandy situations. Plots 1, 14, 20, 21, 23, 31, 34, 35, 36, 37, 64.

WESTERN YELLOW PINE, *Pinus ponderosa* (see bull pine).

WHITE PINE, *Pinus strobus.*

The most valuable and adaptable of all pines; is native to this region and grows rapidly on light soils. In spite of its insect enemies and susceptibility to fire damage, it promises the best returns as a forest investment. Plots 1, 2, 4, 11, 12, 19, 20, 21, 25, 26, 27, 28, 29, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 46, 48, 51, 52, 53, 54, 56, 59, 60, 61, 62, 68, 69.

OTHER CONIFERS.

ARBOR-VITAE, CHINESE, *Biota orientalis.*

Native to the mountains of northern China. Plot 1.

FIR, BALSAM, *Abies balsamea.*

Native to northern United States and Canada. Plot 13.

FIR, RED, *Pseudotsuga taxifolia.*

One of the best timber trees of the Rocky Mountains and Pacific Coast States. Only the mountain form is hardy in this region. Plots 1, 38, 47.

LARCH, EUROPEAN, *Larix europaea.*

A species native to the mountains of central Europe. Plot 1.

SPRUCE, DOUGLAS, *Pseudotsuga taxifolia* (see red fir).

SPRUCE, NORWAY, *Picea excelsa.*

The common timber spruce of Europe. Plots 32, 41, 42, 43, 46, 69.

HARDWOODS.

BEECH, AMERICAN, *Fagus americana.*

A native tree of the northern United States and Canada; does not thrive on light sandy soils. Plot 57.

BIRCH, BLACK, *Betula lenta.*

Native to this region but not well suited for light sandy soils. Plot 59.

BIRCH, GRAY, *Betula populifolia.*

The common birch of old fields; thrives on dry soils, especially after vegetation has been removed by cultivation or burning. Plots 11, 42, 43, 44.

CHESTNUT, *Castanea dentata.*

The most common and useful timber tree of Connecticut in the past; establishes itself with difficulty on light sandy soils. Plots 8, 10, 57, 61, 64.

LOCUST, BLACK, *Robinia pseudacacia.*

A native species which thrives on poor soils, but is subject to injury by borers. Plots 17, 58.

OAK, RED, *Quercus rubra.*

The most rapid growing native oak; does fairly well on sandy soils. Plots 4, 40, 48, 50, 51:

OAK, WHITE, *Quercus alba.*

The most valuable native oak; of very slow growth, and not attractive for forest planting, especially on sandy soils. Plots 13, 17.

FOREST PLANTING IN CONNECTICUT.

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The Progress of Forest Planting.

Statistics recently gathered indicate that approximately 4,000 acres of land in Connecticut have been planted with forest trees since 1900. Forest planting for the purpose of making non-agricultural land productive of a profitable crop of timber is a very recent development in Connecticut, but is receiving more attention yearly, both in this and other states. Prior to 1900 a few land owners had planted small tracts, which were described in a previous report of the Station Forester.* At that time it was estimated that 635,000 trees had been set in recent commercial plantations, covering approximately 500 acres. Since then increasing interest has been shown each year in forest planting.

In order to determine the progress more definitely, circular letters were sent out in November, 1911, requesting a report from those known to have planted forest trees, and forms furnished for detailed records of all forest plantations. Returns were received from a little more than fifty per cent. of the owners and, with information previously secured, a record of two-thirds of the forest plantations established in Connecticut since 1901 was compiled. These returns have furnished much interesting information concerning different phases of planting, which will be presented in this report. Table I gives a summary of forest planting, by counties:

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* Part IV, Biennial Report of the Connecticut Agricultural Experiment Station, 1907.

*TABLE I.

A SUMMARY OF FOREST PLANTING IN CONNECTICUT PREVIOUS TO 1912.

(Compiled from Reports of Owners in November 1911 and from Records in the State Forester's Office.

Name of County.	Area Planted. (Acres.)	Number of Trees Planted.			Number of Land Owners Who Planted.	Range in Area of Individual Plantations. (Acres.)	Number of Towns Where Planting Was Done.
		Conifers.	Broad Leaf Deciduous Trees.	Species Not Separated.			
Fairfield	122.5	115,800	2,000		18	.5– 60	9
Hartford	478.	540,400	†112,400		16	2.5–214	11
Litchfield	212.	269,850	6,400		17	1.0– 75	14
Middlesex	121.5	39,300	85,300		2	4.5–117	4
New Haven	604.	570,550	78,900	‡160,000	12	2.0–227	13
New London	92.5	47,000			8	1.0– 30	4
§Tolland	552.	529,300			10	1.0–400	10
Windham	110.5	158,500			18	1.0– 20	10
Totals	2293.0	2,270,700	285,000	160,000	101	.5–400	75

Total number of trees planted, 2,715,700.

* Does not include planting on State lands by State Forester.

† In addition there were 23½ bushels of seed used direct in reforestation on planting sites.

‡ Chiefly conifers but the number of each not given.

§ Includes some planting done by Union landowners in Woodstock and Ashford, Windham County.

According to the above table 2,715,700 trees have been planted and 2,293 acres forested with commercial species of forest trees. It may be assumed, since this represents two-thirds of those plantations known to have been established, that the whole acreage at the end of 1911 was 3,439.5. In the spring of 1912 the Connecticut Agricultural Experiment Station furnished 500,000 trees at cost for private owners who desired to plant forest. No record is available of the stock furnished by private nursery companies. With this added area planted in 1912, it is probable that not less than 4,000 acres of private forest have been established by planting within the past decade. This area is small in comparison with the large area of unproductive non-agricultural land in this state, but considering the lack of knowledge concerning the nature and value of forest planting and the difficulties of any new task, this progress is excellent.

TABLE II.

Area (Acres)	1–10	11–25	26–50	51–75	76–100	Over 100	Total
*Number of Plantations	70	17	4	3	0	7	101

In Table II the various plantations of which record was secured are classified according to area. They are located in all parts of the state and, as shown above, the majority are twenty-five acres or less in extent. The following seven land owners have planted more than 100 acres each:

A. B. & J. C. Wells, Southbridge, Mass. Plantations in Union, Ashford, and Woodstock, Conn.	400	acres
Harris Whittemore, Middlebury	227	"
Hartford Water Board, City of Hartford	214	"
Ansonia Water Company, Ansonia	165	"
New Haven Water Company, New Haven	142	"
Middletown Water Commission, City of Middletown	117	"
Isaiah Baker, Jr., Hartford	104	"

In nearly all cases, owners begin with a few thousand trees, perhaps only enough for one acre, twelve hundred trees, and then keep planting more each year. Experience with a small number at the beginning tends to ensure success then and in

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*All planting done by one landowner is considered a single plantation in this record.

subsequent planting. A high percentage alive at the end of the first season is an indication that the planting was well done. Instances of complete or nearly complete failure are very few and these are usually traceable to a definite cause, such as heated stock, carelessness in handling, protracted drought following planting, etc. The majority of the plantations have been successful, the average showing a little more than 70 per cent. living—enough to ensure a good future forest crop. Many of the plantations range from 80 to 95 per cent. of trees alive and thrifty.

Initial cost is an important factor in final profit. The total cost per acre has seemed excessive in only five instances, when it ranged from $20.00 to $40.00 per acre. In the returns, the cost of planting (including cost of trees, labor and incidentals) was not always furnished. Such costs as were given are classified as follows:— (1) Those $15.00 per acre or less. (2) Those exceeding $15.00 per acre. The average cost per acre for planting for (1) was $9.68; for (2) $20.78. The average of all costs included under (1) and (2) was $11.86. Such a result may be considered very low since it is generally conceded that successful forest planting usually requires an expenditure of from $10.00 to $15.00 per acre according to conditions.

The principal species of conifers planted was white pine; to a less extent red or Norway pine, Scotch pine, Austrian pine and Norway spruce were used. The kinds of broadleaf deciduous trees chiefly used were oaks, hickories, maples and white ash.

The mistakes as well as the successful practice of forest planting by private land owners during the past ten years furnish information of value to all who undertake planting. The following discussion of forest planting embodies the experience thus gained and may serve as a guide for future work.

INFORMATION AND INSTRUCTIONS REGARDING FOREST PLANTING.

Planting Sites:

In general, forest planting should be confined to non-agricultural lands. Other lands will usually be required for field crops, for fruit-growing or for grazing, especially in view of the present growth of agriculture in the state. Increasing population will eventually demand the use of all lands profitable for the production of food. There will remain, however, not less than a million acres of non-agricultural land for natural or planted forest in Connecticut. Much land is without forest to-day which is fit only for forest growing, and there are some tracts now in woodland that will be cleared and devoted to agricultural development. The character of the soil and topography, accessibility to market, etc., are some of the factors determining future use of land. Forest planting will be an important part of the practice of forestry in making non-agricultural lands productive, and in renewing forest growth where fire and the chestnut bark disease have killed the trees.

The following classes of sites have been recognized in forest planting of the past decade:—

(1) *Open pasture land of poor quality* and farm land found to be unfit and unprofitable for such purpose because too steep, too stony, too thin or poor in soil, or otherwise unsuited for anything except forest growth. Nearly every farm has a greater or less area of this type of land. The owner is paying taxes on it yearly and receiving no income.

(2) *Brush land.* Under this heading those lands may be classed which, through cutting of the forest and subsequent fires, or on account of fire alone, have grown up to low, worthless brush or inferior trees. Brush pastures more recently abandoned may be included in this group, as well as formerly tilled fields that have proved unproductive and lie idle.

(3) *Recently cut-over sprout lands* incompletely stocked with valuable forest species. These should be planted with a sufficient number of trees to ensure complete use of the land and to supplement natural seedlings and sprouts, in order to produce a full yield of timber of good quality.

(4) *Woodland.* Open woodland, only partially stocked with forest, should be underplanted to secure a full yield and to improve forest conditions. Forests in which all the trees have been killed by fire or by the chestnut disease should be cut clean, the slash disposed of by burning and the land planted with conifers.

Plantations have been successfully started and are thriving to-day on all these types of planting sites.

Species:

Both conifers and broadleaf deciduous trees have found a place in past planting. The following list comprises those in private plantations of which the Station has secured a record. The arrangement is somewhat in accordance with their relative importance and the number planted.

Conifers

White pine
Red pine
Scotch pine
Norway spruce
European larch
Douglas fir
Austrian pine
Hemlock
Balsam fir

Broadleaf Deciduous Trees

White ash
Sugar maple
Oaks, red and black
Tulip tree (whitewood)
Catalpa
Black locust
Chestnut
Oaks, white and swamp white

Broadly speaking, conifers should be chosen in preference to broadleaf species for forest planting in Connecticut. Natural woodland is chiefly composed of broadleaf deciduous trees, the so-called hardwoods, and under better management these forest areas will produce much useful timber of that kind. For the most part, lands requiring forest planting are poor in quality and better suited to growing conifers, such as pines, which require less from the soil than broadleaf trees. Conifers endure drought and maintain themselves on relatively dry, thin soils, or very sandy soils where hardwoods would be liable to fail. In yield, they exceed hardwoods in quantity per acre at the same age, and there will always be an excellent market for the material grown. Broadleaf trees may be selected, however, for planting on certain classes of sites for which they are specially adapted, or to produce hardwood material desired by the owner, or to use in mixture with conifers in planting.

Of the conifers, white, red and Scotch pines are to be preferred for commerical plantations; of the broadleaf trees, white ash, red oak, tulip tree and sugar maple deserve consideration. In underplanting woodland it must be remembered that Scotch pine requires plenty of light for development, red pine can endure a little more shade, and white pine still more; good development depends, however, upon ample light and growing space. During the first ten years the rate of growth of white pine under medium shade of birch is one-half what it is in the open, according to experiments in the Rainbow plantations. White pine and red pine seem equally good species for Connecticut. They do well on a variety of soils and situations. On the better classes of soil, red pine equals or surpasses white pine in growth of the first ten years but on poor sandy soil it falls a little behind white pine. Red pine is not attacked by the pine weevil, which injures the leading shoot of white pine in some parts of the state. In case the weevil does considerable damage in a locality it may be better to choose red pine for planting or making a plantation of the two in equal mixtures. They are equally well adapted for growth together, or for growth in pure forest. Scotch pine should be confined to poorer, drier sites, especially sands. This species is the fastest growing of the pines and on dry, sandy soil has grown 10-16.5 feet in ten years from planting. On better classes of soils, Scotch pine is likely to grow so fast that the wood will be coarse and hence less valuable.

Norway spruce should be planted only on better classes of forest soils having fair moisture content, and not on low, wet, poorly drained soils. Such sites are frosty, and Norway spruce has proven susceptible to late frost injury. It is probably better adapted to the northern part of Connecticut than to the southern half.

Austrian pine is not specially recommended; other pines will furnish better products when grown.

Douglas fir, known also as Douglas spruce and Oregon pine, cannot yet be recommended with certainty. The hardy species from Rocky Mountain, and not from Pacific Coast seed, has made fair growth on medium quality soils, although not as rapid as white pine. On dry sandy soils its early growth is very slow, but after eight or nine years it begins to make greater annual height growth. This species is worth thorough trial, and is being experimented with at Rainbow.

Neither hemlock nor balsam fir are promising species for planting, as the wood of both is coarse-grained and of low value. Hemlock is also slow growing, and balsam fir short-lived. White ash and tulip tree are worth consideration for moist but not swampy sites, where the production of these two kinds of wood is desired.

Red oak, and possibly black (yellow) oak also, are useful in reforestation, but are not very fast growers. Plantations may be started from seed in spots or by setting seedlings. Sugar maple, being tolerant of shade, may be useful in mixture with other species and deserves more attention for the establishment of sugar groves in the state.

The planting of chestnut is not recommended until the probable outcome of the chestnut disease is known. Black locust is not recommended because of serious injury by the locust borer. Its ability to spread by seed and by root suckers makes it somewhat objectionable on the farm. White oaks are probably too slow in growth to be profitable for general planting.

A plantation of catalpa near Mystic on fairly good soil has done well in its early growth. This species is liable to winter-killing in most parts of the state, and is reported as doing poorly in Groton, Winchester and Windsor. A plantation, 27 years old, in the town of Fairfield has not made a valuable growth; the trees are not straight and well developed. Pine and larch have done much better in that locality. Most of the sites requiring reforestation are too poor in quality to develop catalpa well. Its final product, also, is not likely to be of much use excepting for posts and small poles, for which its durable wood is well suited.

Season of planting.

Early spring planting of conifers has proven, on the whole, better than fall planting, although there have been some successful instances of the latter. If fall planting is done it should be in the first half of September, so that the roots may have a little growth in their new place before winter. Fall planted stock is generally subject to some drying out; to injury by heavy wet snows since it has little root-hold on the soil; and to heaving out by frost action in the early spring. Broadleaf deciduous trees may be planted in the fall or in the spring, but there is less danger from gnawing animals if planted in the spring.

Spring planting is most successful when the work is started just as soon as the frost is well out of the ground, and the soil in condition to handle readily. Later, the heat tends to increase transpiration from the needles beyond the ability of the newly-set roots to furnish moisture, hence the plant simply dries out and dies. In one instance, late planting resulted in only a small per cent. of the trees being alive at the end of the season. Because it puts out its foliage so early, European larch should be planted very early in the spring or else in the fall. In an average season, the work of forest planting ought to be completed by the first week in May in order that the little trees may be benefited by the spring rains and become rooted before the new growth starts.

Size and Age of Trees for Forest Planting.

In general, one-year-old seedlings of broadleaf deciduous trees are sufficiently large for forest planting and their height varies according to species, etc., from six inches to twenty-four inches. Commercial nurseries often grade their stock according to height.

There are two classes of coniferous nursery stock for forest planting which may be distinguished: namely, seedlings and transplants. Seedlings are those trees grown from seed in beds or in drills until taken up and sent out for planting. Transplants are seedlings which have been transferred from seedbeds to nursery lines in order to develop more stocky tops and more vigorous, compact root systems. Seedlings of conifers used in forest planting are generally two years old, less frequently three years; transplants are three or four years old, more commonly three years. Seedlings are usually transplanted in the nursery when two years old and kept in nursery lines for one or two years. In all forest planting the trees should be young and have a small top and compact root system, with many fibrous roots, in place of long straggling ones. With the use of small trees the initial cost of planting is reduced and a larger per cent. survive. This principle has often been misunderstood in the past. Landowners have spent unnecessary money in establishing forest with trees three to six feet tall, and have not secured the advantage and success anticipated from the use of such large stock.

Two-year-old seedlings of white pine and red pine range from four inches to six inches in height. In years when abundant moisture was well distributed through the growing season, and on sites where competition of other growth was not severe, this size and age have been satisfactory. However, in seasons of drought, such as have been experienced in recent years, many failures in plantations have resulted from the use of two-year seedlings. Three-year-old transplants have generally done much better under such conditions. They range from five inches to eight inches in height and have a better root system as a result of transplanting. Four-year-old stock is larger, more costly, increases the labor and hence the cost of planting. This stock should be used only on sites where the plants have to meet strong competition or other special conditions, and as fillers for failed places in older plantations.

Two-year-old Scotch pine seedlings range from six inches to twelve inches in height and have strong roots. Trees of this age and size are suitable for planting and the use of transplanted Scotch pine is unnecessary in most cases. In one instance on a hot, dry, sandy site, there was heavy loss of two-year Scotch pines due to intense radiation of heat from the surface of the sand resulting in injury to the tender bark near the base. These trees had been grown too close together in the seedbed; they were slender and the bark tissues not thickened as in more open beds. Two-year transplants of Scotch pine are better suited for very dry, sandy sites.

Three or four-year-old transplants should be used when planting Norway spruce or Douglas fir. One-year or two-year-old seedlings are suitable for forest planting in the case of European larch.

The Source of Trees for Planting and their Care.

The Connecticut Agricultural Experiment Station has for a number of years furnished private owners with trees at cost for forest planting in the state, or procured them elsewhere for the same purpose. The table below gives the total number of trees distributed annually to private owners to stimulate forest planting. This was only a temporary policy, because suitable stock could not be procured otherwise during these years at reasonable prices by prospective forest planters. It will probably be given up after 1913 since private forest nursery companies will then be fully able to meet the demand with the right kind of stock and at fair prices.

TABLE III.

Distribution of Trees for Forest Planting.

Connecticut Agricultural Experiment Station.

Year.	Number of Trees.
1908	300,000
1909	300,000
1910	463,000
1911	302,000
1912	672,000
Total	2,037,000

Some of these trees were procured from Germany, but this practice was discontinued, because the white pine blister rust was thus introduced. Since then the United States Secretary of Agriculture, under authority from Congress, has prohibited the importation of pines because of danger from disease and insects. In any event, stock grown in Connecticut or New England is to be preferred because of short distance and time required in shipment. Pines are usually shipped from the nursery in boxes containing bundles of fifty or one hundred trees each, and as soon as received the trees should be "heeled in" near the planting ground. After cutting the cord on a bundle so that plants may be separated, the roots should be dipped in water and the plants placed upright in a trench having one straight side, the earth being packed firmly around the roots. If soil next to the roots is watered occasionally, the trees may be kept in this manner for a week or more if necessary, when conditions are not right for immediate planting. They should be shaded with boughs or heeled in, in some shady place if planting is long delayed.

Number of Trees required per Acre.

The general rule for spacing trees in a forest plantation is to plant them sufficiently close so that they will crowd each other and develop tall, clean boles. This spacing must not be too close, however, or the trees will be so crowded as to stunt their growth, and the initial cost of the plantation will be increased considerably because of the greater number of trees used. According to species and conditions of site, the spacing varies from 4′ × 4′ to 6′ × 6′. Nearly all the plantations in Connecticut have been spaced 6′ × 6′; some, however, being 5′ × 5′, or 5′ × 6′. A spacing of 6′ × 6′, requiring 1,210 trees per acre, is best from the standpoint of economy and will produce good forest conditions as well as satisfactory development of individual trees. A wider spacing results in branchy trunks and lumber of poor quality. This effect of wider spacing has been demonstrated in plantations in Connecticut and elsewhere in New England.

On very brushy land, or on rocky sites, the full number per acre cannot be set, nor in planting poorly stocked cut-over land or in underplanting woodland. When such planting is undertaken advice should be sought from the forester of the Experiment Station, or from private foresters, to determine the density of planting and the subsequent cutting necessary to give underplanted trees proper development.

Preparation of the Site.

Usually preliminary preparation of the whole site is not possible, and it is neither necessary nor advisable. Furrows six feet apart in which to set trees are sometimes plowed on heavy sod land which is relatively level. Furrowing on slopes is a bad practice because there is great danger of surface water-flow washing out the soil and plants along the furrow. Furthermore, a planting site on a steep slope does not require such treatment since grass growth on it is usually light or interrupted.

Removal of brush renders planting easier and a little cheaper, but is expensive and generally not warranted by existing conditions. On the majority of sites, brush is not dense, or may be grubbed out at the spot where the tree is set. Although brush may somewhat hinder plants in growth at the outset by shading or crowding, yet it protects against late frost injury and tends to check evaporation from the soil. Treatment of such sites subsequent to planting will be discussed later on.

Methods of Planting.

Trees should be set at a slightly greater depth than they were in the nursery. Whatever the method, two essential things must be kept in mind by the foreman of the work: (1) that the roots should be protected at all times from drying out, either by carrying the trees in a pail containing water or in a basket with wet sphagnum moss; (2) that the trees should be firmly set in the soil without waste motions, yet with proper care. The mattock or grub hoe has proved to be the best tool.

The slit method has been practiced successfully on sites where there is little brush and a light grass growth, and where the soil is not hard. A square foot of sod is skinned off with a few strokes of the mattock. The blade is then struck down squarely into the ground to its full depth, the handle is raised and with the same motion twisted to one side slightly so as to open the ground at the edge and end of the mattock blade. Into this hole the tree is inserted in an upright position, the mattock then removed and the earth trodden firm with the foot. In this method an extra man or boy keeps from three to five planters supplied with trees as they need them, one tree at a time. A modification of this method, seen in practice on light soil, is to strike the mattock into the ground and, grasping the handle near the end, pull, thus opening a hole at the back of the blade. The tree is thrust to the proper depth into this hole, pressed to one side so as to straighten it up, the mattock removed and the earth firmed by the foot.

In some planting observed by the writer the grass was not scraped off from the spot where each tree was set. There was not a heavy sod, and trees similarly planted the year previous on adjoining land had sustained few losses in number. Removal of the sod is, however, recommended strongly by one authority,* and is probably a safer policy where competing grass, etc., may drain the moisture away from the tree roots or hinder access of water to the soil. Planting is rapid by the slit method. Care must be taken to put the tree at the right depth, to get the roots down into the hole and to leave the tree upright. If the work is not closely supervised, it tends to be careless. In one operation on a hilly site, careless planting under the modified method mentioned above left the trees nearly prostrate in position. The cause is evident: when the planters were working down hill, the tendency was to drive the mattock into the ground at an angle much less than the required right angle (i. e. perpendicular to the surface), the tree was thrust in, the ground tramped down and the tree inclined in each case down hill. Such planting was shallow, leaving the roots subject to drying out, and if the trees live, the lower part of the bole will be curved as it endeavors to assume an upright position. Heavy moist snowfalls will tend to further deform trees so planted.

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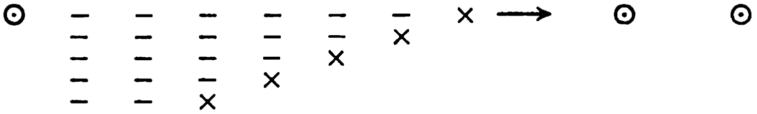
* Hawes and Hawley, Forestry in New England, 1912.

The hole method consists in digging a hole with a mattock after cleaning off a square foot of sod, and setting the tree in this hole. Pairs of laborers are engaged under this method. Those digging holes immediately precede those planting trees. Each planter may carry a pail containing a few inches of water in which the trees are placed upright, or two planters have such a pail between them. An extra laborer keeps the pails replenished. The practice of one laborer laying a tree in each hole in advance of those planting is condemned. It exposes the roots to drying out and under this practice trees are often left lying unplanted in the holes. It is better to have each laborer take a fresh tree from the pail as he needs it. In digging the holes, care must be taken not to scatter the earth, but leave it heaped up close to the hole. The size of the hole depends on the root system of the tree. Generally a hole five or six inches broad and deep is ample. Holes should not be made until just before the planter is ready to set the trees, because under usual conditions the soil in the hole dries out quickly and the roots will then be in contact with dry instead of fresh soil.

In planting, the laborer holds the tree in position at proper depth with his left hand, scoops a few handfuls of earth over the roots and presses it down on all sides with his hands. He then scrapes the rest of the soil into the hole with a few quick motions and tramps it firm with his feet. In doing this care has to be taken not to skin the bark off the stem, and to leave the tree upright in position. Firming the soil is essential to prevent leaving air spaces about the roots which will cause them to dry out and die. Careless planting is more likely to result thus with the hole method than with the slit method. Laborers are likely to grow careless toward the latter part of the day or fail to use care at all times unless closely supervised.

In the hole method, a fine-grained clayey soil will bake and evaporate moisture more or less rapidly. To avoid this the soil may be shredded roughly and spread, grass side down, around the plant. In lighter soils, such as sandy loam or sand, this is less essential. In the finer-grained soils capable of holding much moisture, there is danger of the plants being heaved out of the soil the spring of the second year, one year after planting. Such soils expand and contract much with alternate freezing and thawing in early spring. The slit method is preferable on sites of this character, since there is less danger of the soil heaving than there is when the soil has been loosened up in hole planting. In one plantation set by the hole method, large loss resulted from heaving of the trees. Regularity of planting is desirable in order to secure an even forest and uniform growing space for the trees. On rough Connecticut hillsides, regular spacing and exactly straight rows are an impossibility without great pains and additional cost, which is scarcely warranted. Distances need not be measured with exactness but careless spacing should be avoided. Laborers may be furnished six-foot rods or sticks to use until they learn to space the trees accurately. It is well to start on one straight side of the tract, if there is such, and work regularly back and forth. Stakes 5 or 6 feet tall should be set at the end of rows and one or two along the row. By these the laborers can line themselves in and keep the rows straight. If the first row is set straight, the other rows may be kept straight without setting stakes by lining with plants in adjoining planted rows. The following diagram illustrates this:



⟶ Planting Direction.
⊙ = Guide stakes.
× = Planters.
– = Trees planted.

Forest planting should be carefully supervised. If only four or five laborers are engaged in it, one may be put in charge if he is capable; he may plant and at the same time direct the work of the others. If many laborers are employed it is better to have one foreman who spends his time entirely in supervision.

Cost of Planting.

Mention has already been made (see p. 488) of the average cost of forest planting. Many factors have an influence on the cost; such as size and price of trees, conditions of planting site, spacing, price of labor, kind of labor and experience or inexperience in planting, nature of supervision, etc. Practically no information was given in reports of plantations as to these separate factors, the total cost figure being generally stated or the cost of trees and cost of setting them. Two-year seedlings have ranged from $2.50 to $3.50 per thousand in price in recent years, three-year transplants from $4.50 to $6.00 and four-year transplants $7.00 to $8.00 or more, per thousand. These prices are for conifers, none being available for the broadleaf trees planted. The latter would not ordinarily, however, exceed the prices given above. Close spacing increases cost, since more trees per acre are required. The price of labor does not vary to a great extent, but its quality is exceedingly variable. After a few days' experience two men, one digging holes and the other setting trees, can plant from 800 to 1,200 trees per day. If labor costs $1.75 per day, this would make the cost of planting the trees on a 6′ × 6′ spacing $3.50 to $5.25 per acre. Adding to this the cost of three-year-old transplants (figured at $5.50 per thousand) the cost of the planted trees per acre, exclusive of incidental expenses, would range from $10.10 to $11.85. With experienced labor and an open planting site this cost can be reduced somewhat. On more brushy sites it must inevitably be higher. If two-year-old seedlings are used, the cost is lowered by $2.50 to $3.00 per acre. Subsequent filling of failed places is liable to raise the net cost somewhat, however.

Planting under the slit method is faster and in many cases has been as successful as the hole method. On the basis of a 6′ × 6′ spacing, 1,200 trees to the acre, and the price per thousand $5.50 for three-year transplants, the average total cost of one extensive planting by this method was $9.29 per acre. In the case referred to, however, the average cost of 250,000 trees set in different years was $4.93, which would lower the average total cost to $8.61 per acre. The writer examined these plantations and some of them require partial replanting to make a complete stand. This would increase the total cost somewhat.

Careful planting is well worth while, but there cannot be the same care taken in planting or in preparation of the ground as is customary in ornamental or shade tree planting. In one series of large plantations in New Haven County in which some 300,000 trees have been planted, the work has been done painstakingly and what failures of plants occurred have been filled. Some land had to be cleaned of brush, etc., prior to planting, and the spacing was 5½ feet by 5½ feet, 1,440 trees to the acre. The total cost of trees, cleaning land, setting trees, some replanting and incidental expenses was $16.36 per acre. Replanting was found to be proportionately more expensive than the original planting. These plantations are in very good condition and probably the most nearly perfect of any in the state.

An owner in Litchfield County who has set 36,000 white pines, using his own farm labor, reports the total cost of trees, labor and incidental expenses as $8.00 per acre (spacing 5′ × 6′). The estimated per cent. alive is 75 to 80. He has not filled failed places. Such a low cost indicates the possibilities for planting by farmers at reasonable expense. In this case the low cost is due to intelligent personal supervision by the owner and the use of skilled farm labor. The land planted was open and grassy, with little brush, an average condition for open land planting. He reports that the men averaged more than one thousand trees each per day, an unusually large number. Planting done under contract has ranged in cost from $9.50 per acre (including cost of trees) to $16.25 per acre.

Losses and Replanting.

There are many causes of loss in forest planting. Death of trees may sometimes be traced to one or several of these, while in other instances it may be impossible to determine the cause. Some of the factors of loss can be controlled by the planter, such as planting poor stock in bad condition, allowing roots to dry out, careless planting, etc. Other factors, such as weather conditions, cannot be controlled. If, however, the former factors of loss are prevented, there is a much greater chance of success, even under adverse natural conditions following planting. Losses are most likely to occur during the first two years while the plants are establishing their root systems. Small slender trees with straggling roots, such as two-year white pine seedlings, suffer greater losses than stocky, well-rooted three-year-old transplants. The latter become established in their new site much more quickly, root deeper and are less subject to drought injury. This is upheld by observations of an owner in Litchfield County who has planted extensively on open land.

It is important that the trees be in good condition. Improper packing, long distance shipments, or unfavorable conditions in transit, may result in what is termed heated stock. Such trees have mouldy tops and even a scorched appearance, especially in the centers of bundles. In such cases the injured trees should be culled out or the shipment discarded and a new lot requested. There is relatively small danger of this trouble if stock is secured from nurseries in the state or near by. Trees should have a fresh, healthy appearance and the roots should be moist when received.

Care of the trees after arrival and until planted has been discussed (see p. 495). Conifers are very sensitive to the drying out of the fibrous roots. Subsequent losses will be heavy if the roots of the trees have been much exposed to sun and wind. Careless planting accounts for a great percentage of loss. In certain plantations the writer has traced whole rows where nearly every tree was dead, while adjoining rows showed scarcely one failure. It was evident that one laborer had been careless. This can be avoided by close supervision or better yet by discharging inefficient, careless laborers promptly on discovery. Careless planting may be detected by pulling on the plant after it is set to see that it is firm in the ground.

Planting early when the soil is fresh, the air cool, and the principal spring rains still to come, is most favorable to success. In later planting, losses are likely to occur, especially if a period of dry weather follows. Plantations on exposed sites, such as slopes with a south or southwest aspect, suffer severely from drought unless they have some protective vegetation, and heavy losses are likely to occur there. More trees die in plantations established on sod land than on poorer land with bunchy grass growth. In the former case, clearing away the sod where the tree is set will improve conditions. Several planters report a larger per cent. of the trees alive which were set on brushy land, in light birch growth, and on land "with some cover, not in grass, with some tall scattering trees," than on open sites.

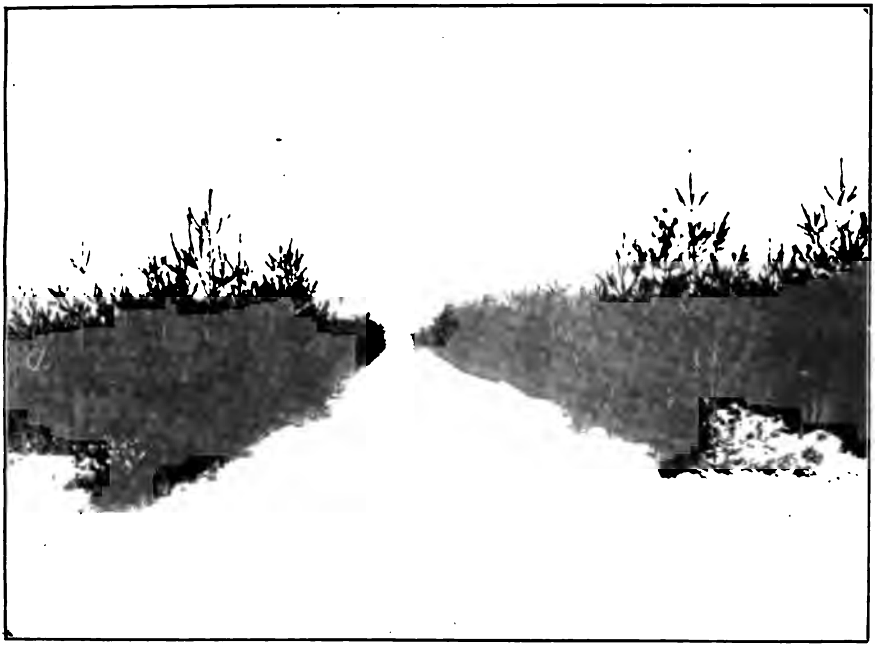
Weather conditions are the greatest factor in success or failure in forest planting. The results in recent years have been very good considering the many unfavorable periods of long drought. A dry period in May and June is very hard on trees just set in forest plantations. A long summer drought in July and August

Forester's office at Connecticut Agricultural Experiment Station.

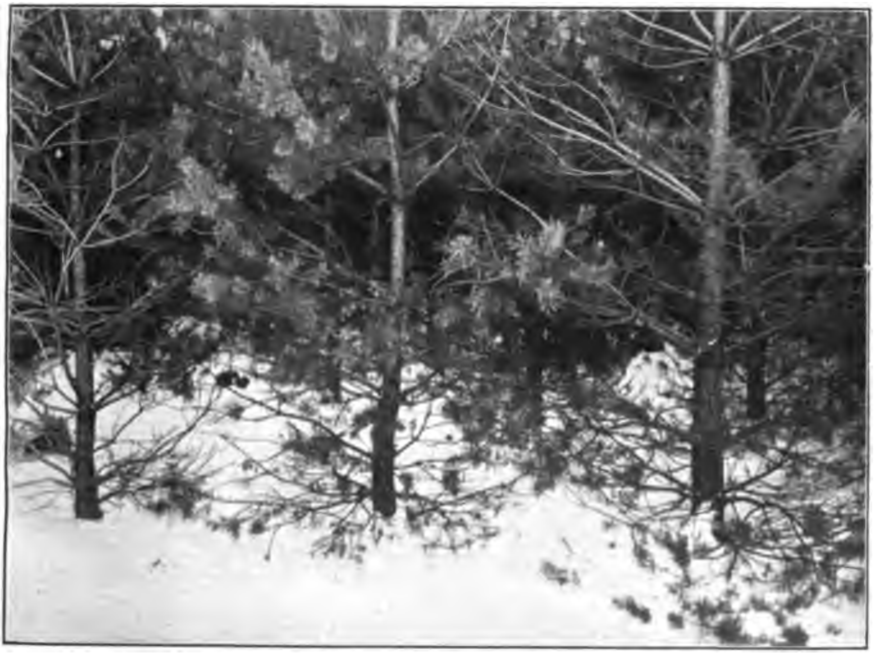
Exhibit of Forestry Department at Agricultural Fairs.

Seed-beds of white, Scotch and red pine on Station Grounds.

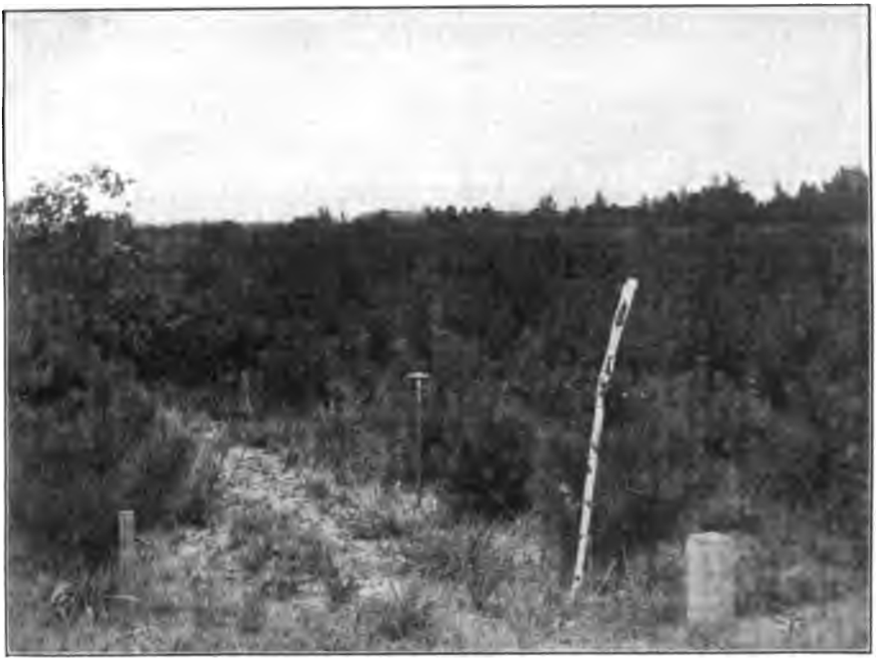
Pine plantations at Rainbow, plots 22-25.



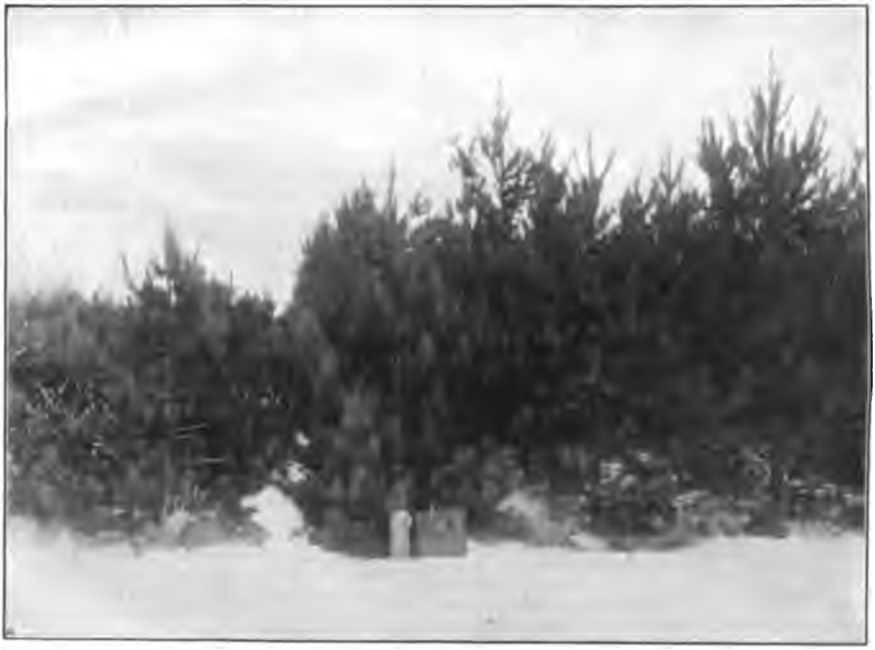
Fire lane between plots 60 and 68, Rainbow.



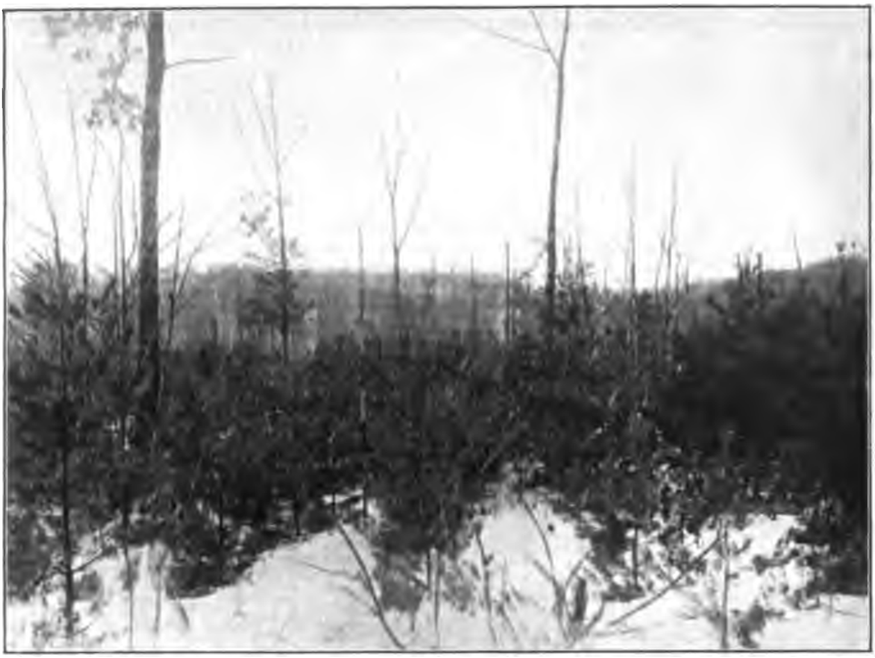
Interior of Scotch pine plantation, plot 23.



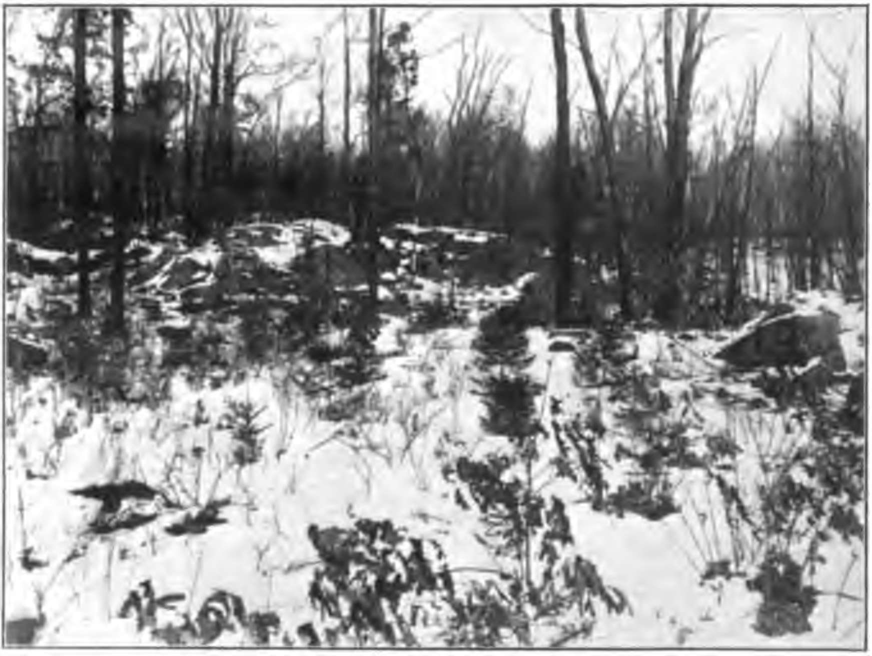
Red and Scotch pine on plots 22 and 23 in 1905.



Red and Scotch pine on plots 22 and 23 in 1912.



Eight-year-old white pine plantation on cut-over land.



Norway spruce under hardwoods nine years after planting.

is especially trying because of the great heat of these months. A fall drought finds the trees more fully established and does less damage. Abundance of rainfall is not so important as a moderate amount of moisture well distributed throughout the growing season.

A compilation from the reports on the plantations of data on cost of planting, number of trees planted and percentage of trees living, showed no relation between the cost and the resultant stand. In plantings of all grades of cost, there were successes as well as more or less complete failures. High cost does not necessarily indicate great painstaking in planting, nor does low cost, on the other hand, indicate hasty, careless work. The average of living trees for all plantations in which this item was reported is a little over 70 per cent. A relatively small number were below 50 per cent., and many were 75 to 85 per cent. successful. If losses are greater than 20 per cent., the blanks should be replanted the year following first planting. In those plantations having losses of 20 per cent. or less the blanks need not be filled unless they occur in groups which would result in wide gaps in the stand. The purpose of replanting is to secure a full future yield from the soil and proper development of merchantable timber of good quality.

Damage to Plantations—Protective Measures.

No protective measures can be taken against loss by drought. It is not practicable, because of the high cost, to water the trees if a dry period ensues either when planting them or subsequently. In experiments at Rainbow on a dry, hot, sandy site, Norway spruce and white pine suffered damage from intense heat of the sun's rays and drying out of the soil. The plants were a foot to two and a half feet tall, and had grown under considerable shade of gray birch and pitch pine, hence were tender. The injury was caused by complete removal of the overgrowth during August in an experiment to ascertain whether cutting in that season would check undesirable sprouting of birch.

Late spring frost sometimes injures the new growth of pine and spruce, the latter being considerably more susceptible to this injury. It does not occur on slopes where air drainage is good, but on more level sites where cold air collects and is stagnant. In the spring following the experiment mentioned above a late frost injured both species in numerous instances, but especially the spruce. The plot from which the birch growth was cleared was level and was surrounded on three sides by similar growth. It thus formed a sort of frost pocket, since air circulation was cut off by the adjoining growth. The needles of nursery transplants of pine are sometimes browned by winter injury, but this has not seemed to affect subsequent growth. Frost injury and drought injury sometimes produce a browning of the needles of older pines in plantations. The trees are weakened and some die, but loss has not generally been great in Connecticut from this cause. (See reports of Station Botanist for 1907 and 1909-10.) Only one case of frost injury to plantations of conifers was reported by private owners. This form of damage is not a prominent one. A light growth of brush, etc. may be of advantage on some planting sites since it affords protection from frost and winter injury. Catalpa has been reported to be winter killed in several localities.

Fire has destroyed small areas of planting in at least six instances, including one plot of an acre at Rainbow. The total area reported is about fifteen acres. Considering the total acreage planted, the loss is almost negligible. Coniferous plantations are especially susceptible to fire injury, and fire once started is difficult to stop. Two measures of prevention are suggested: (1) arousing of local interest in the plantation, its purpose and value; (2) an adequate system of fire lines. Both of these have combined to prevent serious damage by fire to the 100-acre tract of experimental planting by the Station at Rainbow in the town of Windsor. One fire started there on May 8, 1911, but was extinguished before it had covered more than an acre, the fire lines assisting greatly in stopping it.

Old roads through planted areas should be kept clear. In extensive plantations, cleared lanes bare of vegetation, dividing the area into smaller blocks, should be maintained if many causes of fire exist in the locality. Clearing inflammable material by burning along lines of danger, such as traveled roads, railroad lines, etc., will largely prevent danger from fire or prove of material assistance in checking fires. Posting of notices calling attention to the danger from fires and requesting coöperation in preventing them tends to educate local inhabitants and prevent fires. Non-resident owners should pay a small sum to some local person residing nearby to watch out for fires in especially dangerous seasons.

Animals cause damage in plantations. In hardwood plantations grazing animals will browse the young trees down to the ground. In coniferous plantations trees are not usually eaten, but the ground is packed and small trees are trampled and deformed. Plantations should not be grazed in early years and in later years the crown canopy shades the ground, killing the grass, hence grazing is out of the question at any time. In five plantations, grazing injury as described was reported. In one instance where feed was poor, cattle browsed the needles from young Scotch pines.

Rodents do some damage in plantations. Squirrels will eat planted chestnuts or white oak acorns, often securing a majority of the nuts planted. Tarring the nuts is suggested as a preventive measure. Rabbits gnaw the bark of locust trees in late winter and in one instance killed the greater part of such a planting. They also bite off the shoots of red oak and keep the trees eaten down to small bunches of sprouts. This injury occurred in red oak plantations on sandy land at Rainbow. Shooting and poisoning are possible remedies. Field mice may gnaw the stems of white pines causing considerable injury, but only one case of this kind was reported. Remedy in any such instances is poisoning the mice, but it is recommended that special advice be asked from the Station Staff before poisoning is undertaken since, carelessly used, it will result in death to the natural enemies of the mice as well.

Insects and fungi are important sources of damage. The chief ones are the white pine weevil and the chestnut bark disease. For detailed information on these subjects, application should be made to Dr. W. E. Britton, State Entomologist, and Dr. G. P. Clinton, Station Botanist, New Haven, Conn. Specimens should accompany the description of insects or fungous diseases injuring plantations.

The larvae of the white pine weevil mine in the terminal shoots and cause trees to become deformed by loss of their leaders. In June and July, top shoots turn brown when so affected and new growth wilts. The best measures to adopt are cutting off leading shoots below the injury and close to the next lower whorl of branches, burning these at once. If this is done early in July before the insect has emerged from the shoot in adult form, the numbers of the insect are materially reduced and the possibility of future damage is lessened. Serious damage has been done in plantations where no remedy has been applied. In 1911 weevil injury was reported from eighteen towns in plantations from five to ten years old.

Cleaning Plantations.

Pine plantations in which birch or other species have sprung up, and plantations set in brush or on cut-over land, require cleaning to prevent injury to the pines. Cleanings are usually made in stands from three to ten years old. Unless the interfering brush or small tree growth is cleaned out, many pines are killed by heavy shading, or are deformed by the competing worthless growth. The first cleaning should take place within two or three years after planting. One can give no definite rule as to the year, but must judge by the condition of the pines. There is no need of a painstaking costly removal of all growth other than the pines. In the first cleaning it is only necessary to go along the rows and to cut back to the ground with a bush hook or axe those bushes, sprouts and seedlings which directly interfere with the pines. Another cleaning may not be required but if within a few years the other growth again overtops the pines which grow slowly at the start, more work will be needed. In a second cleaning it will usually be unnecessary and of no advantage to cut the growth to the ground. It is better to cut it back so that it is below the tops of the pines. This will tend to check further sprouting and should also reduce the cost of the operation. Further cleaning will probably be unnecessary since the brush, etc. will then be crowded out rapidly by the pines.

Pruning.

Pruning of live branches is not recommended, since it reduces food producing foliage area. If the trees have been set at the proper distance apart, they will close together in two to twelve years and the lower branches will die for want of light. The dense shade also tends to conserve the moisture in the soil.

Subsequently the dead branches drop off, or may be cut and knocked off if the owners desire to undertake such expense in view of eventually producing clear saw timber. Considering the uses to which pine is usually put when cut, no material advantages come from trimming off dead branches.

Direct Seeding to Form a Forest.

Sowing or planting seed on the site where a forest is desired has been practiced to a small extent in Connecticut. In the case of conifers such as white pine, the seed may be broadcasted on unprepared or prepared ground at the rate of four or five pounds to the acre. Results are very uncertain and in experiments on sandy soil no trees were secured. The cost of seed and labor equals the cost of planting, while results in the latter case are much more sure. In Enfield, the Shakers started pine forests in this way on cultivated land some thirty years ago with success, but very large quantities of seed were used. Similar work to-day would be very costly and there are few sites susceptible of cultivation which will be put into pine. Partial seeding in prepared strips or in spots spaced 6′ × 6′ may be done at less cost, but experiments in this method with white pine have resulted in failure. Red oaks, chestnut and some other trees may be started from seed planted in spots on the site where forest is desired. The spots are prepared by scraping away the sod and after loosening the soil with a hoe or a mattock, two or three nuts or acorns are planted about an inch deep in the spot and the soil pressed down with the foot. A red oak plantation started in this way was entirely successful in one observed instance. Other plantings, especially of edible nuts, resulted in three-quarters loss. The nuts were given no protective treatment.

NOTE BY THE DIRECTOR.

Owing to the limits imposed by statute on the number of pages of the Station Report which may be printed at the State expense, an account of the other portions of the Station work done during the year cannot here be given.

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State of Connecticut

PUBLIC DOCUMENT No. 47

State Geological and Natural History Survey

COMMISSIONERS

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Arthur Twining Hadley, President of Yale University
William Arnold Shanklin, President of Wesleyan University
Flavel Sweeten Luther, President of Trinity College (*Secretary*)
Charles Lewis Beach, President of Connecticut Agricultural College

SUPERINTENDENT

William North Rice

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FIFTH BIENNIAL REPORT OF THE COMMISSIONERS

OF THE

State Geological and Natural History Survey of Connecticut

1911 - 1912

HARTFORD
Published by the State
1912

HARTFORD, CONN., December 31, 1912.

HIS EXCELLENCY, SIMEON E. BALDWIN, Governor of Connecticut,
Hartford, Connecticut.

Sir: — I have the honor to transmit to you herewith, in behalf of the Connecticut Geological and Natural History Survey Commission, the report of the Superintendent of the work, covering the period of two years ending December 31, 1912.

Very respectfully,
FLAVEL S. LUTHER,
Secretary of the Commission.

STATE GEOLOGICAL AND NATURAL HISTORY SURVEY

FIFTH BIENNIAL REPORT

COÖPERATION WITH UNITED STATES GEOLOGICAL SURVEY IN STUDY OF WATER RESOURCES

In the Report of the Commissioners of the State Geological and Natural History Survey to the General Assembly in 1911, it was intimated that two plans were under consideration for the inauguration of a kind of work different from that in which the Survey had been engaged in previous years and having a somewhat more direct economic bearing. The two projects under consideration were a survey of the soils of Connecticut, and a survey of the water resources of Connecticut. After thorough investigation, it was decided that the latter project was the more desirable of the two. Accordingly, in the past two years the bulk of the appropriation of the State Geological and Natural History Survey has been applied to an investigation of the water resources of the state.

One consideration making it desirable to enter upon the investigation of the water resources of the state at this time, was that the United States Geological Survey was ready to coöperate in such investigation, appropriating from the United States Treasury an amount equal to that which was appropriated from the State Treasury. It was therefore practicable for us, by the use of $2,000 of the appropriation made by the State of Connecticut, to secure for the work on the water resources the expenditure of a total amount of $4,000.

Investigation of the water resources of the state seemed to the Commissioners of the State Survey especially timely, in view of the fact that most of the large towns of Connecticut have, in recent years, been on the verge of suffering from water famine. The consumption of water, both for domestic and manufacturing purposes, is rapidly increasing with the growth of our population and the increased development of manufactures. In addition to other uses of water, it is evident that in the near future increased attention must be given to the development of water power. The exploitation of the national supply of coal is going on with increasing rapidity, and in the consumption of coal we are using not our income but our capital. The available supply of coal tends to exhaustion, and the diminished supply must mean in the near future a considerable increase in the cost. It is evident, then, that in the near future our manufacturing industries must depend more largely than in the past upon some cheaper form of power than that which is afforded by the combustion of coal.

It is believed, also, that irrigation is destined to play a large part in the future development of the agriculture of Connecticut. There is, of course, no such necessity for irrigation in Connecticut as exists in the arid region of the country. The average rainfall for Connecticut is sufficient for agricultural use; but our rainfall is more or less irregular, and our farmers often suffer heavy losses from occasional long periods of drouth. It is practicable, by means of irrigation, not only to carry on agriculture in localities where the rainfall is always insufficient, but to avoid the heavy losses to agriculture from occasional periods of drouth in districts ordinarily well watered.

In view of the growing demands upon our water supply, it is evidently fitting that there should be a thorough study of our water resources. The streams should be gaged, that we may know their rates of flow in different seasons of the year and their fluctuation in different years. The gaging of the streams must, therefore, be carried on not for one year but for a term of several years, in order that the necessary data may be obtained. Profiles of the streams should be constructed so as to indicate suitable sites for storage reservoirs and for the development of water power.

The underground waters of the state should also be studied. Already our population is coming to rely largely upon deep wells for manufacturing and other purposes. The geological structure of Connecticut is not such as to make it possible to say with approximate certainty, as can be done in some parts of the country, at what depth an abundant supply of water can be encountered. But it is believed that a careful study of wells and springs throughout the state will render it possible to map the distribution of ground water in such a way that the search for an underground supply of water will not be so completely a lottery as it is at present.

In view of these considerations, it was determined by the Commissioners to apply $2,000 of our appropriation to coöperative work with the United States Geological Survey on the water resources of the state. The following contract was accordingly signed by the Director of the United States Geological Survey and the Superintendent of the State Geological and Natural History Survey of Connecticut.

"THIS AGREEMENT, made and entered upon this 31st day of May, 1911, by and between GEORGE OTIS SMITH, DIRECTOR, for and on behalf of the UNITED STATES GEOLOGICAL SURVEY, the first party, and WILLIAM N. RICE, SUPERINTENDENT, for and on behalf of the CONNECTICUT STATE GEOLOGICAL AND NATURAL HISTORY SURVEY, the second party, WITNESSETH:

"1. That there shall be maintained within the State of Connecticut a coöperative survey of water resources, which shall consist of such studies of the occurrence, amount, and availability of underground waters, and of the sources, capacity, and availability for economic use of the rivers and streams, as shall be necessary to enable the people of the State of Connecticut to make the most comprehensive development thereof.

"2. That the investigations shall be under the supervision of the first party, who shall be represented in all work, negotiations, and disbursements involved in the performance of this agreement by a duly accredited representative, whose agency shall be formally certified to for the information and guidance of the second party; that the methods of investigation shall be those usually followed by the first party, and they shall be subject to such modification or improvement as may be suggested by the second party and approved by the first party.

"3. That the location of the investigations and the character thereof shall be from time to time determined upon by the parties hereto or their duly accredited representatives; and, during the progress of the work, all notes, maps, measurements, gagings, and other material shall be open to the inspection of the second party, and, if the work is not being carried on in a manner satisfactory to said party, he may on formal notice terminate this agreement.

"4. That the first party shall contribute toward the maintenance of the work herein provided the sum of one thousand dollars ($1,000) to be expended during the fiscal year ending June 30, 1912, and a further sum of one thousand dollars ($1,000) to be expended during the fiscal year ending June 30, 1913; PROVIDED, That, should the Congress of the United States fail to make provision for the water resources investigations of the first party in suitable amount to enable said party, under an equitable distribution of its appropriation for this purpose, to continue the work herein provided during the year ending June 30, 1913, this agreement shall lapse on June 30, 1912; that the second party shall allot for the investigations herein provided the sum of two thousand dollars ($2,000), which shall be expended on or before June 30, 1913; that the accounts for the work herein provided shall, except as above specified, be rendered against the allotments of either party, the same to be determined upon by said parties or their respective representatives, according to convenience, or to the balance remaining in the respective allotments; PROVIDED, That all expenses shall eventually be divided between the two agreeing parties in such a way that they shall be equal on June 30, 1913.

"5. That the results of the investigations, surveys, observations, measurements, and computations, and all other matters acquired in the due performance of this agreement, shall become the property of the first party, certified copies thereof to be delivered to the second party on demand.

"6. That the results of the work contemplated in this agreement, together with the interpretations thereof, will be published by the first party, said publications to contain full and complete statements of the relation thereto of each party as set forth in this agreement; that these publications shall be made as soon as possible after completion of each unit piece of work which may be determined upon by said parties as of suitable scope for a separate publication, and the cost of such publications shall not be included in the allotments made by either party; PROVIDED, That nothing herein shall act to prevent the second party from compiling and arranging for independent publication any of the results collected under the terms of this agreement; PROVIDED FURTHER, That in such independent publication the relation of the first party thereto shall be clearly stated.

"IN WITNESS WHEREOF, We have hereunto set our hands and seals the day and year first herein written.

GEO. OTIS SMITH,
Director, United States Geological Survey,
The First Party.

WM. NORTH RICE,
Superintendent, Connecticut State Geological and Natural History Survey, The Second Party."

From the foregoing contract it will be seen that the work has been carried on under the direction of the United States Geological Survey. It has been placed under the charge of Professor Herbert E. Gregory, of Yale University. Professor Gregory has given very much attention to the study of water resources, and his paper on Underground Water Resources of Connecticut, published in 1909 as Water-Supply Paper 232 of the United States Geological Survey, is the best statement extant of our present knowledge in regard to that subject. It is certain that no man could have been selected better qualified to take charge of this investigation.

It will be seen from the contract that the results of the work, when ready for publication, are to be published by the United

States Geological Survey in the usual form of their publications, and at the expense of the United States. The contract, however, gives to us the right to republish any part of these results in the series of Bulletins of the State Geological and Natural History Survey; provided, only, that, in any form of publication of a special Connecticut edition, credit shall be given to the United States Geological Survey for their share in the work.

Work on Water Resources during the Past Two Years

The total appropriation of four thousand dollars (two thousand from the United States and two thousand from the State of Connecticut) has of course sufficed only for a very modest beginning of the survey of our water resources. It has been deemed best to use the whole amount in a study of underground waters in certain selected areas. The field work has been done, under the direction of Professor Gregory, by Arthur J. Ellis, M.A., Junior Geologist, U. S. Geological Survey. The following account of his work is quoted from a letter of Mr. Ellis to the Superintendent of the State Survey.

"Under the direction of Prof. H. E. Gregory, I have studied the water supplies, with especial attention to underground waters, in selected areas in Connecticut, which represent the typical geologic conditions of the state. These areas are:

"1. The Hartford area, including the towns of Hartford, West Hartford, Newington, Wethersfield, Manchester, East Hartford, South Windsor, East Windsor, Windsor, and Bloomfield.

"2. The Stamford area, including Stamford and Greenwich.

"3. The Canaan-Salisbury area, including Canaan, North Canaan, and Salisbury.

"4. The Willimantic area, including Windham and Franklin.

"5. The Saybrook area, including Saybrook, Essex, Westbrook, and Old Lyme.

"In each of these areas the towns have been studied as units, and the results are to be given on the same basis, but grouped with reference to the areas. A map of each town has been prepared, upon which are shown data relating to underground waters, and contour lines representing the position of ground water with reference to the land surface. In the Hartford area the rock surface is also shown by contour lines. In all except the Hartford area, these maps will show the distribution of timber and tillage, and of rock outcrops and Glacial drift.

"Field assays have been made of several hundred samples of water taken from springs, dug wells, drilled wells, and brooks.

An effort has been made to obtain data concerning all the drilled wells in the areas studied, and as many dug wells have been examined as were deemed necessary to locate the position of the water-table throughout the areas, and to supply a general knowledge of the condition of dug wells, and the amount and quality of water obtained from them."

Coöperation with United States Geological Survey in other Work

It is proper here to mention the fact that the work on the water resources of the state is not the only work in which there has been coöperation between the United States Geological Survey and the State Survey of Connecticut. In the study of the peat deposits of the state, a work of great importance, both scientific and economic, in regard to which a bulletin is soon to be published, the State Survey was greatly aided by the generous coöperation of the United States Geological Survey, as is stated more fully on page 19 of this report. In another instance, we were able to render some service to the United States Geological Survey. When Professor T. M. Dale was working on a bulletin on the Granites of Connecticut for the United States Geological Survey, he requested the Superintendent of the State Survey to furnish an introductory chapter on the general geological relations of the granites of the state. Such a chapter was accordingly prepared by Professor H. E. Gregory, author of the chapter relating to the crystalline rocks in Rice and Gregory's Manual of the Geology of Connecticut (Bulletin 6 of the State Survey). Bulletin 484 of the United States Geological Survey, on the Granites of Connecticut, accordingly bears on its title-page the words, "Prepared in coöperation with the Geological and Natural History Survey of Connecticut."

General Scope and Plan of the State Survey

While it has been deemed best to devote the bulk of the appropriation for the past two years to the coöperative work on the water resources of the state, and to undertake no other new work, it is not forgotten that the scope of the Survey, as defined in the act of 1903 by which the Survey was established, is much broader. That act proposed for the Survey two subjects for investigation; viz., the geology of the state, and the natural history, or botany and zoölogy, of the state. It has been presumed to be the intent of the law that the appropriation should be divided with some approach to equality between geology and biology. The law further specifies three aims with reference to which the work should be prosecuted: — first, the purely scientific aim of advancing our knowledge of the geology and natural history of the state; second, the economic aim of leading to the most effective conservation and utilization of the resources of the state; third, the educational aim of promoting the work of the schools of the state by the publication of the results of investigation in a form adapted for the use of teachers.

It will be appropriate to outline briefly the plans adopted for the carrying out of these objects, and the work which has been already accomplished, or which is in progress.

The plan of organization which was outlined in the first report has been retained. Only one salaried officer has been appointed by the Commissioners; viz., the Superintendent. Other scientific men have been engaged to investigate particular subjects and prepare reports or bulletins thereon. In the great majority of cases, the terms of contract with these scientific men have been that the investigator should receive a certain sum as compensation when the bulletin presented was accepted by the Superintendent, and that a certain allowance should also be made for the expenses of the work, the allotment for expenses to be drawn upon from time to time as the expenses were actually incurred. In some cases, however, this form of contract has been impracticable, as investigations have been commenced and prosecuted in regard to which it could not be foreseen how soon they would result in conclusions definite enough for publication. In such cases the agreement has been to pay the investigator a small sum per diem, a maximum limit being prescribed in every such case.

Each report prepared is published as a separate bulletin, the bulletins being numbered consecutively, generally in the order in which they are received. Each bulletin bears the name of the author or the names of the authors, and each author is responsible for his own work. The bulletins are issued in paper covers, but a part of the edition is reserved for binding. Bulletins 1 to 5 have been bound as Vol. I., Bulletins 6 to 12 as Vol. II., and Bulletins 13 to 15 as Vol III. The bound volumes are especially desirable for public libraries and similar institutions, in which complete sets of our publications are to be preserved. The pamphlet form, in which each bulletin is complete in itself, is convenient for the large number of students, teachers, and others who have use for some particular bulletin. The publications of the Survey are distributed by the State Librarian. They are given liberally to colleges, public libraries, geological surveys, and other scientific institutions, and to scientific men of repute in the branches of science with which the respective bulletins are concerned. In many cases books and papers of great value are received in exchange for the publications of the Survey. All books and papers thus received are deposited in the State Library. The publications of the Survey are also distributed liberally to citizens of our own state, particularly to teachers who can make use of them in their work. In the case of persons in other states who are not known as scientific men, and who appear to have no special claim for the donation of the publications of the Survey, the bulletins are sold at prices sufficient to cover the cost of printing and transportation.

BULLETINS ALREADY PUBLISHED

The following is the list of the bulletins already published: —

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904.
2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut: by Herbert William Conn.
3. A preliminary Report on the Hymeniales of Connecticut: by Edward Albert White.
4. The Clays and Clay Industries of Connecticut: by Gerald Francis Loughlin.
5. The Ustilagineæ, or Smuts, of Connecticut: by George Perkins Clinton.
6. Manual of the Geology of Connecticut: by William North Rice and Herbert Ernest Gregory.
7. Preliminary Geological Map of Connecticut: by Herbert Ernest Gregory and Henry Hollister Robinson.
8. Bibliography of Connecticut Geology: by Herbert Ernest Gregory.
9. Second Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906.
10. A preliminary Report on the Algæ of the Fresh Waters of Connecticut: by Herbert William Conn and Lucia Washburn (Hazen) Webster.
11. The Bryophytes of Connecticut: by Alexander William Evans and George Elwood Nichols.
12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908.
13. The Lithology of Connecticut: by Joseph Barrell and Gerald Francis Loughlin.
14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation: by a Committee of the Connecticut Botanical Society.
15. Second Report on the Hymeniales of Connecticut: by Edward Albert White.
16. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton. Part I. General Introduc-

tion: by Wilton Everett Britton. Part II. The Euplexoptera and Orthoptera of Connecticut: by Benjamin Hovey Walden.

17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-1910.

18. Triassic Fishes of Connecticut: by Charles Rochester Eastman.

19. Echinoderms of Connecticut: by Wesley Roscoe Coe.

Four of these, viz., Bulletins 13, 16, 18, and 19, have been published since the last biennial report.

Bulletin 13, on the Lithology of Connecticut, includes a general introduction to lithology by Professor Barrell, of Yale University, and a special description of forty-one typical rocks from Connecticut localities by Dr. Loughlin, of Massachusetts Institute of Technology. In the general part of the work, lithology is treated in relation to mineralogy and dynamical geology, so that the student may learn somewhat of the agencies by which the different types of rocks are produced, as well as their composition and characteristic aspect. In both the general and the special part of the work attention is given chiefly to those characteristics of rocks which can be recognized by the naked eye or by the simple microscope, with comparatively little reference to the phenomena which can be observed only by the examination of thin sections under the compound polarizing microscope. This limitation in the treatment of the subject renders the work adapted to the use of comparatively elementary students. The usefulness of the work in the educational institutions of the state will be greatly enhanced by suites of specimens of rocks from the typical localities described in the special part of the paper, which have been distributed to colleges, normal schools, high schools, and academies in the state, on condition that the respective institutions should pay the cost of transportation. Any suites of specimens remaining in the possession of the Survey after such distribution will be sold and the money paid into the treasury of the state.

Bulletin 16, on the Insects of Connecticut, forms the beginning of a series of papers on that class of animals, whose publication may be distributed through a considerable number of years. It is needless to comment on the economic importance of the class of insects, many insects being among the worst enemies of the agriculturist, while others, insectivorous or parasitic in habit, tend to hold in check the destroyers of agricultural products. The various parts of the work will be written by specialists on various groups, under the general direction of Doctor Britton, Entomologist of the Connecticut Agricultural Experiment Station. The present bulletin includes two parts of the proposed work. Part I. gives a brief outline of the general characters of insects and their relations to other allied groups of animals, the classification of the group, and their economic relations. In Part II., Mr. Walden gives a catalogue, with analytical keys, of the two orders, Euplexoptera and Orthoptera. The former order is a small and comparatively insignificant one, including the insects commonly called earwigs. By many entomologists the Euplexoptera have been regarded as merely a subdivision of the Orthoptera. The Orthoptera constitute a larger and more important order, including, besides some less familiar forms, the cockroaches, the locusts and grasshoppers, the katydids, and the crickets. The mere mention of the names, locust and grasshopper, is enough to suggest the importance of the economic relations of the Orthoptera. Part I. of this bulletin is illustrated by a series of plates, representing typical examples of all the principal orders of insects. Part II. is illustrated by a number of plates from photographs of entire insects representing different groups of Orthoptera, and by numerous figures in the text from drawings of diagnostic parts of the anatomy of various families and genera.

Bulletin 18, on the Triassic Fishes, by Professor Eastman, of the University of Pittsburgh, is a very important contribution to the paleontology of the state. The area of Connecticut is by no means rich in fossils. The crystalline rocks of the eastern and western highlands have proved as yet utterly barren of fossils. Whatever fossils some of these rocks may have once contained have been entirely obliterated by the processes of metamorphism. The Triassic formation of the Connecticut Valley has afforded scarely any fossils, excepting tracks of reptiles and amphibians on some of the beds, and remains of fishes and a few species of plants in two or three thin strata of black shale intercalated among the red shales and sandstones. The scantiness of fossils in this formation has made difficult the determination of its geological age. Professor Eastman has made a very careful study of all the important collections of the fossil fishes of this formation. He has been able thus to make a more exact determination of some features of the anatomy of the animals than has been made before. He has also made comparisons of the fish fauna of our Connecticut beds with the fish faunas of other Triassic formations in various parts of the world. This comparison leads him to the opinion that the age of our Connecticut formation corresponds most nearly, not with the uppermost European Trias (Keuper or Rhætic), as has been of late generally supposed, but rather with a somewhat lower horizon, near the boundary between the Muschelkalk and the Keuper.

Bulletin 19, by Professor Coe, of Yale University, on the Echinoderms of Connecticut, will be the first paper published by the Survey on the marine zoölogy of the state. The

Echinoderms include the creatures commonly called sea-urchins and starfishes. Though not a large class as regards the number of species, the Echinoderms are an interesting group. They are among the marine animals which are large and conspicuous, and most of them have skeletons which are readily preserved. They are accordingly among the forms which attract the attention of visitors to the shore. Professor Coe's full descriptions of our species will be useful to teachers, particularly in the towns along the coast, where the pupils may easily become acquainted with these animals. One genus of the Echinoderms, the common starfish, is of great economic interest, since it is one of the most destructive enemies of the oyster. Professor Coe has given much attention to the relation of the starfish to the oyster industry. The work is beautifully illustrated with plates showing the aspect of the living animals, and others showing their anatomical structure.

BULLETINS IN PRESS OR APPROVED FOR PUBLICATION BY THE BOARD OF CONTROL

One bulletin is now in press; and two others have been approved for publication by the Board of Control, but have not yet gone to press on account of an unexpected delay in the revision of the manuscript. These are the following:—

20. The Birds of Connecticut: by John Hall Sage and Louis Bennett Bishop, assisted by Walter Parks Bliss.

22. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton. Part III. Hymenoptera of Connecticut: by Henry Lorenz Viereck.

23. The Peat Deposits of Connecticut: by Charles Albert Davis.

Probably no work which the Survey has announced as in preparation has been awaited by so many people, in the state, and out of it, with eager expectation, as the work of Mr. Sage and Dr. Bishop on the Birds of Connecticut. In their careful studies, continued for many years, a vast amount of information has been recorded in regard to the dates of arrival and departure of our migratory birds, the localities of rare birds, and the food and habits of the birds. This bulletin will be of interest not only to ornithologists, but also to teachers and farmers, and to the multitude of people who have learned to love the birds. The publication of this bulletin will help to correct some erroneous impressions, widely prevalent among farmers, in regard to some of our birds. Many of the birds of prey, for instance, which are commonly regarded as the farmer's foes, are really his friends. In fact, the sharp-shinned hawk, Cooper's hawk, and the great horned owl, are probably the only birds of prey that are in any considerable degree injurious to agriculture in Connecticut. It is matter of regret that the publication of this bulletin has been so long delayed, owing to the pressure of other duties and cares which made it impossible for the authors to give the amount of time necessary for the completion of the work. Happily a very competent editorial assistant was found in W. P. Bliss, M.A., of Columbia University. Mr. Bliss is himself an earnest student of the birds, and his general training has given him an excellent fitness for editorial work. By his work in the collation of the notes of Mr. Sage and Dr. Bishop, it has been made possible to bring this valuable bulletin to completion.

Bulletin 22, by Mr. Viereck, of the United States National Museum, forms the second instalment of the work on the Insects of Connecticut, under the general direction of Dr. Britton, of the Connecticut Agricultural Experiment Station. It deals with the Hymenoptera, which form one of the largest and most important of the orders of insects. The marvelous instincts and habits of bees, wasps, and ants have always attracted the interest of thoughtful observers. Many of the Hymenoptera are of very great economic interest. The bees, by their transportation of pollen from flower to flower, are indispensable for the fertilization and consequent propagation of a great many plants. Many of the smaller Hymenoptera, as the ichneumon flies, are parasitic upon other insects, and thus serve to keep in check insects which would otherwise be destructive pests to the agriculturalist. Some of the Hymenoptera, on the other hand, as the saw-flies, are themselves prominent among the destroyers of agricultural products. Mr. Viereck is himself a specialist on some of the groups of Hymenoptera, and he has had the aid of a number of collaborators who are specialists on other groups of this large and varied order. Among the writers who have contributed chapters to the work, are the following:—Alexander Dyer MacGillivray, Assistant Professor of Entomology and Invertebrate Zoölogy in Cornell University; Charles Thomas Brues, Curator of Invertebrate Zoölogy, Public Museum, Milwaukee, Wis.; William Morton Wheeler, Professor of Economic Entomology in Harvard University.

Bulletin 23 treats of the Peat Deposits of Connecticut. Like other regions covered by the great ice sheets of the Glacial period, the surface of Connecticut was left dotted with innumerable lakes and ponds, many of which have been converted into peat bogs by the accumulation of the débris of vegetation. The peat is not only of great scientific interest, both to the geologist and to the botanist, but possesses considerable economic importance, having uses as a fuel and as a fertilizer, and being capable also incidentally of employment for various other purposes. Attention has recently been called to the economic value of peat by the investigations of the United States Geological Survey, which have shown its special fitness for use in the gas-producer. It was, therefore, deemed desirable to make a special investigation of the peat deposits of Connecticut, and this was rendered practicable by the generous coöperation of the United States Geological Survey. During the summer of 1907 the field work of the investigation was substantially finished. The localities of all the important peat bogs of the state were visited, the area of those bogs was noted, their depth was determined by a sounding apparatus, and samples for analysis were collected from various depths. This work was accomplished by E. C. Miller, A.B., and T. T. Giffen, A.B., of Yale University. Professor C. A. Davis, of the United States Bureau of Mines, who was employed by the United States Geological Survey in the summer of 1907 for a reconnoissance of the peat deposits of the Atlantic border of the country from Maine to Florida, was permitted by the courtesy of the United States Geological Survey to spend a few days in Connecticut at the beginning of the season of field work. He was able, therefore, to give Messrs. Miller and Giffen the necessary instruction in regard to methods of work. The bulletin which is now nearly ready for publication, will contain a general paper on the scientific and economic relations of peat, by Professor Davis, who has made himself eminently an authority on the subject. It will also contain a digest of the notes of Messrs. Miller and Giffen in regard to their field work. A selection of samples collected by Messrs. Miller and Giffen have been analyzed in the laboratory of the United States Geological Survey, and reports of those analyses will be included in the bulletin. The State Survey is very greatly indebted to the liberality of the United States Geological Survey for the all-important assistance of Professor Davis at the beginning of the investigation, and for the analyses made in the laboratory of the United States Geological Survey. The attention which has recently been given to the scientific and economic relations of peat has brought into notice the valuable work on peat from the chemical standpoint done many years ago by Professor S. W. Johnson, of Yale University, the pioneer in agricultural chemistry in this country. Professor Johnson's book is out of print, and his work on peat had been almost forgotten. The forthcoming bulletin will render his important work once more accessible by the republication of the important parts of his book, edited and revised by his friend and pupil, Dr. E. H. Jenkins, Director of the Connecticut Agricultural Experiment Station.

BULLETINS ACCEPTED FOR PUBLICATION

The following bulletins have been accepted for publication by the Superintendent, but the appropriations hitherto available for printing have sufficed only for the bulletins in the previous lists.

Drainage and Glaciation in the Central Housatonic Basin: by Ruth Sawyer Harvey. This paper is an interesting study of some changes in drainage resulting from the events of the Glacial period.

The Amphipods and Isopods of Connecticut: by Beverly Waugh Kunkel. These are interesting groups of Crustacea, chiefly marine. This paper will be the second instalment of the series on the marine zoölogy of the state, inaugurated by Professor Coe's bulletin on the Echinoderms.

Triassic Life of the Connecticut Valley: by Richard Swann Lull. Professor Lull has made himself eminently an authority on the Dinosaurs, a remarkable group of extinct reptiles whose presence in the Connecticut Valley is attested by a few skeletons and numerous footprints. This paper presents not merely a catalogue of fossil species, but a vivid picture of the life of Triassic times.

Central Connecticut in Geologic Time: by Joseph Barrell. This paper will be of special value to teachers, by reason of its realistic representation of the geographical changes which this region has undergone in the course of geological time.

Check-list of the Insects of Connecticut: by Wilton Everett Britton. As it must be many years before the Guide to the Insects of Connecticut can be finished, it is believed that a check-list will be useful in the meantime.

Glacial Geology of the New Haven Region: by Freeman Ward. A detailed study of the Glacial Geology of a single district. Valuable in itself, and valuable as a contribution to the investigations which are expected eventually to afford material for a general map of the Glacial geology of the state.

The Bacteria of the Fresh Waters of Connecticut: by Herbert William Conn and Lena Raye Potter. This is of great value, being the result of work prosecuted in the laboratory of Wesleyan University continuously for a number of years.

UNFINISHED WORK

Professor H. E. Gregory and his assistants have done a large amount of field work on the Glacial geology of the state. It is hoped that some of the results of this work will appear at an early date in a bulletin on the Glacial geology of the Naugatuck Valley, and that later the material will be accumulated for a general report with map of the Quaternary of the state. Dr.

F. P. Gulliver's studies of the terraces of the Thames River have added much to our knowledge of some phases of Quaternary history, but are not yet ready for publication. Dr. G. P. Clinton has a bulletin on the Downy Mildews, a group of Fungi very pernicious to agricultural interests, well advanced towards completion. Professor A. E. Verrill has done much work on a bulletin on the Stalk-eyed Crustacea (including a full discussion of the economic relations of the lobster). Dr. W. E. Britton has in hand a third instalment of the Guide to the Insects of Connecticut, relating to the Hemiptera, or bugs and their allies.

DISTRIBUTION OF THE APPROPRIATIONS

The expenditures for work which has been completed and for which full payment has been made since the last biennial report, have been as follows:—

Name	Work	Compensation	Expenses
W. N. Rice	Superintendence, 1909-11	$400.00	$300.00
F. Ward	Glacial Geology	192.50	54.63
R. S. Lull	Triassic Life of Connecticut Valley	200.00	101.97
H. W. Conn	Bacteria of Fresh Waters	200.00	570.88
B. W. Kunkel	Amphipods and Isopods	100.00	48.00
W. E. Britton	Check-list of Insects	100.00	16.50

The allotments for work which is still in progress, or for which full payment has not been made, are as follows:—

Name	Work	Compensation	Expenses
W. N. Rice	Superintendence, 1911-13	$400	$500
F. P. Gulliver	Terraces of Thames River	425	
H. E. Gregory	Glacial Geology	828	
C. A. Davis and others	Peat Deposits	659	
G. P. Clinton	Downy Mildews	50	25
J. H. Sage and L. B. Bishop	Birds	200	400
W. E. Britton and others	Guide to Insects	525	325
A. E. Verrill	Stalk-eyed Crustacea	150	250

PLANS FOR FUTURE WORK

I. Geology

It may be said in general that there is need of more detailed study in most parts of the state than has yet been accomplished. The area of the state most thoroughly studied as regards the bed rocks is that of the Triassic formation. The area where detailed work is most lacking as yet is that of the eastern crystallines. The geological work which has been done in much of eastern

Connecticut amounts to little more than a reconnoissance. The Manual of Geology, and the Geological Map by which it is supplemented, bear most eminently the character, not of final reports, but of reports of progress. Their publication was amply justified by the need, on the part of teachers and others, for publications which would set forth in convenient and intelligible form our present knowledge of the geology of the state. But they certainly will require very much of correction in detail. It is, moreover, not unlikely that more detailed study will bring to light facts which will lead to very important changes in the general conception of the geological history which is recorded in our rocks.

The necessity for more detailed study in various parts of the state is even greater in regard to surface geology than in regard to the geology of the underlying rocks. Professor Gregory and Drs. Gulliver, Ward, and Harvey have made a beginning of such investigation; but a vast amount of careful work must be done before we can reach the true history of the Quaternary era in our territory.

A class of geological papers which would be of great educational value would be a series of geological guide-books to various regions of the state. In these guide-books directions sufficiently detailed to be practical should be given for excursions to localities where the most characteristic and instructive geological phenomena could be seen. Professor James D. Dana prepared years ago a book fitted to serve this purpose for the vicinity of New Haven; but even for that region there is need of a guide-book brought down to date, as regards both the scientific interpretation of phenomena and the arrangement of the itinerary. A series of such books for various districts of the state would make the study of geology in the high schools more real and genuine than it can otherwise be.

A report on the mineralogy of our state would be very useful. Lists of American localities of minerals have been published in a number of editions of the works of J. D. and E. S. Dana on mineralogy, the latest being in the sixth edition of the System of Mineralogy, published in 1892. A list of Connecticut minerals by Hattie E. Cochrane, dated 1894, is contained in the Report of the State Board of Education for 1896. Neither of these lists is by any means complete. Moreover, a report of the mineralogy of the state should be much more than a mere list of minerals occurring in the respective towns. Such a report should give more detailed information in regard to localities of interesting and important minerals, and should enter into some discussion of the geological relations of the minerals.

In the introductory chapter of the Manual of Connecticut Geology is found a brief discussion of the physical geography of the state in relation to geological structure. A subject whose treatment in a bulletin or in a series of bulletins would be of great educational value, would be the physical geography of various parts of the state, particularly in relation to human life and history. In such publications, the influence of geographic conditions in the location of towns, in the determination of routes of travel, and in the control of the industries of the state, should be discussed. Such bulletin or bulletins on the physical geography of the state would be of great interest to all intelligent citizens, and particularly to the teachers in our schools.

II. Botany

The labors of the Connecticut Botanical Society have given to us a list of the flowering plants of the state, and of the ferns and their allies. This paper affords much information in regard to the geographical and topographical distribution of particular species of plants. An appropriate line of investigation, and one in regard to which it may be hoped that the Survey may be able to publish important papers in the future, would be the more extended study of the distribution of plants with reference to altitude, geological formation, distance from the sea, temperature, and rainfall, and the grouping of plants into plant societies in different areas — in short, the study of what is now called the ecology of plants.

The systematic botany of the flowering plants has been comparatively well worked out for this region of country. Much less has been done in regard to the flowerless plants, and particularly in regard to the lower classes of flowerless plants. The paper of Professor Evans and Mr. Nichols on the mosses and liverworts, those of Professor White on the larger fungi, those of Dr. Clinton on the microscopic fungi, that of Professor Conn and Mrs. Webster on the fresh-water algæ, and that of Professor Conn on the bacteria, make a good beginning in this direction. But there are a number of groups of the lower flowerless plants for whose study very little material is accessible to students or even to teachers in Connecticut. Interesting groups which should be treated in future bulletins of the Survey are the lichens and the marine algæ.

III. Zoölogy

Professor Conn's paper on the protozoa makes a good beginning of the study of the life of our fresh waters. In future years attention should be given to other groups of fresh-water organisms; for instance, the mollusks, worms, crustacea, and fishes.

No general work dealing with the marine fauna of the Connecticut coast has been published since the very valuable paper by Verrill and Smith on the Invertebrate Animals of Vineyard Sound, published in the Report of the United States Commissioner of Fish and Fisheries for 1871-2.* The State Survey has made a beginning of a series of papers on our marine fauna, in the paper of Professor Coe on the echinoderms, already published, and the papers of Professor Verrill and Dr. Kunkel on the crustacea, of which the former is well advanced towards completion, and the latter has been accepted for publication. Papers on other groups of marine organisms should follow. Some of these papers would be of very great educational value, while some of them would be important from an economic point of view, since our marine fauna includes some species which are among the important resources of the state, and other species which are destructive of important resources.

Of the principal orders of insects, the orthoptera are treated in a bulletin already published, and the hymenoptera in one which has been accepted for publication. A bulletin on the hemiptera is in preparation. Other orders remain to be treated, among which are several of those most numerous in species and most important in economic relations.

A bulletin on the birds of Connecticut is now in press; but the mammals, reptiles, amphibia, and various groups of terrestrial invertebrates await consideration in future years.

THE CONTINUANCE OF THE SURVEY

What has already been said in regard to the work accomplished or in progress and the plans for future work, makes it obvious that the business of the State Geological and Natural History Survey is not rapidly approaching completion. In fact, the State Survey should be recognized as a permanent institution. The Geological Survey of the state of New York was commenced in 1836. There is at present no organization in the state of New York bearing the title of Geological Survey, but there is a Science Division of the Educational Department of the state, whose staff includes a State Geologist, a State Botanist, a State Entomologist, and a number of other scientific workers. Under one form of organization or another, the work of investigation of the geology and natural history of New York under the auspices of the state has already been substantially continuous for more than two generations. There is no prospect that it will ever be finished.

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*Most of the animals living in Long Island Sound and Fisher's Island Sound are included in the fauna of Vineyard Sound.

In a number of states, indeed, Geological Surveys have been organized, prosecuted for a few years, and concluded by the publication of so-called final reports. But there can be no final report on the geology, the botany, or the zoölogy of any district of country. In those states whose Geological Surveys have published what have been called final reports, enlightened citizens and legislators have sooner or later come to see the necessity for organizing a second, and in some cases a third, Survey, and doing the work over again. The sciences of nature are progressive; new discoveries from time to time put old facts in new relations, and raise new questions whose answer requires new methods of investigation. There are changes also in the arts which depend upon the application of the sciences, as well as in the sciences themselves. New forms of raw material become valuable, new modes of utilizing well-known materials become practicable. On the economic side, as well as on the purely scientific side, arises a necessity that the work of a Survey which had been supposed to be completed should be done over again.

If a State Survey is recognized as a permanent bureau, it can publish, from time to time, supplementary reports correcting and amplifying its previous work as may be necessary. It can be ready also to give attention to particular investigations which may have a special importance, for economic or other reasons, at some particular time. Moreover, the work of a Geological and Natural History Survey can be carried on much more economically by the plan of small appropriations maintaining a permanent organization, than by the plan of attempting to complete the work in a few years and then doing it over again a generation later. Field work can be done in the summer vacations by college professors, teachers, and others who are willing to do a certain amount of such work for very small compensation. Investigations can be made and bulletins can be written in large degree in odds and ends of time, by men who receive salaries for work in the colleges and schools or in museums and other scientific institutions. Under such conditions men of a high grade of ability and attainment are willing to offer for publication the result of their investigations for merely nominal compensation. The amount of valuable material already published, and the amount which is ready or nearly ready for publication, by our Survey, in comparison with the very small cost, is a striking illustration of the economy of this method of procedure. If, on the other hand, the work of a Survey is to be completed, and final reports presented, in a few years, it is generally necessary that a number of competent men should be employed to give practically their whole time to the work. They must be paid salaries which will justify them in resigning any official positions which they may hold and taking their chances of securing other employment when the work of the Survey is finished.

The appropriation for the Connecticut Geological and Natural History Survey is one of the smallest of those which are made by the states at present maintaining such surveys. Six states make annual appropriations for geology alone ranging from ten thousand to twenty-eight thousand dollars, exclusive of cost of publication, and five others make annual appropriations ranging from ten thousand to fifteen thousand dollars, inclusive of cost of publication. In comparison with an appropriation of ten thousand dollars for geology alone, our appropriation of fifteen hundred dollars for geology, botany, and zoölogy seems rather small. It is fair, however, to consider that Connecticut is not a large state, and that there is no probability that further geological exploration will develop great mineral wealth or create a great mining industry. While a moderate permanent increase of the appropriation would be desirable, the experience of our Survey has shown that creditable and useful work can be done with a small appropriation. The Survey should be recognized as having passed the experimental stage and having vindicated its claim to be a permanent institution.

Plans for the Next Two Years and Appropriations Desired

However useful the kinds of work outlined above, in Geology, Botany, and Zoölogy, may be, it is the judgment of the Commissioners that they should be postponed for the present, in order that the investigation of the water resources may be pushed forward as rapidly as possible. It is obvious that the sooner the work of surveying the water resources can be completed the greater will be its utility. The United States Geological Survey is willing to continue the same sort of coöperative agreement which has been in force for the past two years. The amount of money which they are willing to allot to the work in Connecticut will depend upon the amount of the appropriation made by Congress in its present session. It is almost certain, however, that the United States Geological Survey will be able to make at least as large an appropriation for the next two years as for the past two years. Two years ago the officers of the United States Geological Survey would have been willing to make a considerably larger appropriation for work in the state of Connecticut if we had been able to duplicate it. Whether they will be able, in view of present demands in other parts of the country, to increase the allotment to Connecticut, cannot be known till the appropriations have been made. The Commissioners of the State Survey are of the opinion that we ought to offer for the ensuing biennial term a larger appropriation than the former one, on condition that the United States Survey be able to duplicate it.

We accordingly earnestly petition the General Assembly to appropriate, for the ensuing biennial term, $1,000 for administrative and miscellaneous expenses, and $3,500, or such part of that sum as the United States Geological Survey may be able to duplicate, for coöperative work in the investigation of water resources.

In accordance with this plan, it is proposed that no new work on the general lines of geology, botany, or zoölogy be commenced during the ensuing biennial term. Work which has been commenced will be pushed forward towards completion as rapidly as possible, and bulletins which have been or which may be completed will be published as speedily as practicable. The appropriation of $1,000 for administrative and miscellaneous expenses will pay the salary of the Superintendent, and necessary traveling and incidental expenses; and will also allow, in some cases in which it may be necessary, small additional payments for work which has been undertaken, for which the allotment originally made proves to be inadequate.

The General Assembly of 1911 granted the petition of the Commissioners of the State Survey for an amendment to the law in regard to the printing of public documents, authorizing, in the case of the general and special reports of the State Survey, the printing of such numbers of copies as the Board of Control may determine, not exceeding 4500. This amendment to the law in regard to public printing carries out the intent of the act by which the Survey was established; which obviously contemplated the printing of the general and special reports of the State Survey, from the funds available for the printing of public documents in general. We, therefore, ask for no special appropriation for publication for the ensuing biennial term.

MERIDEN SANATORIUM FROM A DISTANCE.

State of Connecticut

PUBLIC DOCUMENT No. 53

REPORT

OF

Board of Directors to Establish County Homes for the Care and Treatment of Persons Suffering from Tuberculosis

TO

THE GOVERNOR

For the Period Beginning October 1, 1910, and Ending
September 30, 1912

PRINTED IN COMPLIANCE WITH STATUTE

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BOARD OF DIRECTORS.

Dr. George H. Knight, Lakeville.	Term expires July 1, 1915.
John F. Gunshanan, Hartford.	Term expires July 1, 1913.
Dr. Stephen J. Maher, New Haven.	Term expires July 1, 1917

SECRETARY.

George I. Allen, Middletown.

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REPORT OF THE

Board of Directors to Establish County Homes for the Care and Treatment of Persons Suffering from Tuberculosis

State of Connecticut

To His Excellency, Simeon E. Baldwin, Governor, and to the General Assembly:

Two years ago the Board of Directors submitted to the Governor of the State, as the law required them to do, the first report of their work. This report covered the period from July 1, 1909, to September 30, 1911. It told of the securing of land and the erection of buildings at Meriden, Shelton and Hartford, and of the admission of ninety-one patients at Meriden, forty-one patients at Shelton, and of no patients at Hartford.

In the report which we have the honor to hand to you today we tell you of the work done from October 1, 1910, to September 30, 1912. We hope that you will consider the work well done. We know that it has not been done perfectly. In fact, we propose to call your attention to our failures and mistakes as well as to our successes. We trust that every citizen of Connecticut who is interested in the stamping out of human tuberculosis will take time to acquaint himself with the details of the great campaign that his State is conducting against this insidious and powerful enemy of mankind.

Connecticut's method of attacking her tuberculosis problem is in many ways different from that adopted by any other state, and in some ways in advance of that adopted by any other state. The Commission has been in receipt of requests from all over the country for reports containing detailed accounts of Connecticut's method. We hope that in this report will be found satisfactory answers to the questions that the interested have been asking.

The included medical and financial reports of the superintendents of the sanatoria at Meriden, Shelton and Hartford speak for themselves, and will repay careful perusal, but a short non-statistical review of the conditions at these institutions will not be amiss.

MERIDEN.

This sanatorium, nearly half-way up the face of one of the mountains just west of the city of Meriden, and dimly visible from all the trains on the tracks south of the city, and commanding a lordly view of the nearby busy valley and distant eastern hills, consists of: an infirmary for the very sick men and women, at the entrance to the grounds; a shack or pavilion for men who are not obliged to stay in bed, but who are not "early cases;" a shack for early cases of men; a shack for early cases of women; a nurses' home, in which also most of the help are housed; a superintendent's cottage; and a barn.

The last four buildings have been erected during the period covered by this report, and all four were absolutely necessary for the proper conduct of the institution. Some ground for criticism might be afforded by the comparatively substantial appearance of the nurses' home; but it is impossible to induce competent trained nurses to do such work as they must do at a state sanatorium for tuberculosis unless they have decent, even attractive quarters, to which they may retire when not on duty.

One of the frequent criticisms of the State's institutions heretofore made by the physicians and the anti-tuberculosis organization of the State was that there was not sufficient provision for separating the "early cases" of women from the "late cases" of women. This lack also accounted in great measure for the disproportionately small number of female patients at the sanatoria. Our answer to these criticisms has been to build at Meriden and Shelton a handsome new shack that will give twenty-four women patients in the first stages of the disease as good accommodations as they can get anywhere.

As to the cottage of the resident superintendent, no argument is needed to prove that he and his wife and children ought to have a home somewhat apart from the patients' quarters.

The supply of water to the Meriden institution has been the cause of considerable anxiety to us during the past two years. The water is Meriden city water. Frequently the pressure has not been enough to force water to the upper buildings, or even to the upper floors of the lower buildings. First one, then another engine was installed to pump the water to the required elevation. When the new women's shack was begun it was decided, after consultation with the officials of the Meriden fire department, that it would be necessary to construct a large water-tank high above all the sanatorium buildings, and to use our engines to keep it full, and from it to run pipes to the upper buildings. This has been done.

The rear of the infirmary almost touches the steep face of the cliff. Originally a large retaining wall was built to protect the building from the slides of rock, sand and snow that the storms loosen on the upper reaches of the mountain. Last winter most of the retaining wall gave way, and threatened to carry down with it the covered bridges leading from the infirmary to the men's shack. Temporary repairs were made and the endangered part of the bridge closed, but sooner or later a comprehensive and probably costly method of protection of the infirmary building from these rock slides must be adopted.

Among other lesser improvements made at Meriden during the past two years may be mentioned: the connecting of the men's shack and the infirmary with a covered passageway; the enlarging of the sewer system and the connecting of it with the Meriden sewer system; the construction of a new, capacious icebox; the installation of electric lights; the renovating of the plumbing and steam fitting; the erection of screens on all buildings, and of awnings on all verandas; the installing of annunciators throughout the infirmary, and of an inter-communicating telephone system for all the buildings; the purchase and erection of a spiral fire escape for the infirmary; the purchase of twenty-four fire extinguishers; the painting of one of the shacks and of the interior of the infirmary; the laying of board walks and temporary walks throughout the grounds; the purchase of two horses, harness, one farm wagon, one light delivery wagon, one Concord wagon, one six-passenger coupe; the purchase of furniture for all new buildings; of a safe and a filing system for the office; of a baking oven; a vegetable-peeling machine; a dishwashing machine, and various smaller kitchen utensils; the purchase of fur coats for patients, and blankets, linen and duck clothing for employees; the equipment of a small bacteriological laboratory, and of a nose-and-throat operating room; the purchase of an incinerator, and the construction of a building to house it; the purchase of a sterilizer for the laundry.

It is generally recognized that patients in a tuberculosis sanatorium are strongly influenced by their immediate environment, and that carefully groomed lawns and walks make for good discipline and for the dispelling of homesickness. It would be easy to spend profitably a good many thousand dollars on grading and turfing and gravelling about the Meriden Sanatorium. At present no funds are available.

Some day, when our bills for construction and equipment are lower, we hope to install at Meriden a central heating plant and a laundry, a small morgue, and a fumigating shed, and a recreation hall for the ambulant cases.

SHELTON.

Almost at the summit of one of the highest hills west of the Housatonic River, south of Shelton and close to the main road to Bridgeport, stand the buildings of the second of the State's sanatoria. To the east and north the patients have a view of the tree-clad highlands; to the south, in the foreground, of the deep, winding valley of a silent, shadowed river; and in the far distance of the gleaming waters of the Sound, and of passing ships. The charm of the location makes an immediate appeal to every visitor, be he bard or yokel.

All the main buildings, except the infirmary, are grouped together on the southern brow of the hill. They are the men's shack to the west, the women's shack to the east, the dining hall between them, the nurses' home and the doctor's cottage to the south, and the just-completed new shack to the north.

Almost at the foot of the hill is the combined infirmary and administration building. Midway is the farmhouse. The Shelton institution is unique in that it has a farm on which some of the vegetable supplies of the sanatorium are raised. Most farms connected with tuberculosis sanatoria are costly luxuries, but the superintendent of Shelton, Dr. Stockwell, reports that the farm at Shelton has at least paid for itself. The fault with the sanatorium at Shelton is the great distance that separates the infirmary from the other buildings. The problems of administration are thereby greatly increased. In stormy winter weather this separation entails hardships for the staff, and magnifies their anxieties as to fire and other institutional dangers. It is hoped that in the coming years of prosperity the state will be able to erect a new infirmary and administration building in one of the unused fields near the rest of the institution.

A few weeks after the writing of the first report of the Board of Directors, that is, in October, 1910, it was found that the water supply at Shelton was entirely inadequate, and it was necessary to transfer twenty-two of the patients to the Meriden Sanatorium, and to keep them there until a new system could be developed. This was furnished during the following winter. "This new system," Dr. Stockwell reports, "gives us a water of fine quality, and is capable of furnishing many more thousands of gallons than we use."

The principal new construction and equipment at Shelton during the two years was: the erection of the new shack for the early cases of women, identical with the one described in the Meriden report; the erection of a superintendent's cottage; the erection of covered passageways from the men's and the women's shacks to the dining hall; the erection of a morgue and disinfecting shed; the erection of an incinerating plant, in which all sputum and garbage is destroyed; the screening of all the buildings; the installing of a dish-washing machine, and of a vegetable-peeling machine, and of a high-pressure boiler for the sterilizing plant; the reshingling of the tool house; the digging of a drain for the administration building; the refitting of the barn, and the purchase of two horses and harness and of a Concord buggy; the building of a new road from the highway to and around the principal buildings; the partial grading of the fields on which the principal buildings are; the construction of board walks; the equipment of a bacteriological laboratory and a nose-and-throat operating room; the purchase of fur coats for patients, and of duck suits for help.

The needs at Shelton, besides the new infirmary already referred to, are: a central heating plant, a laundry, a recreation hall, a new nurses' home, or the enlarging of the present one, a storage building, and a continuation of the grading and road building.

HARTFORD.

The next time your train reaches Newington Station, on your way to or from Hartford, look out the eastern window of your car and observe a wide breach in the thick forest that crowns the distant ridge. A few yards south you will see the roofs of the buildings of the Hartford State Sanatorium. It is, however, best approached from the other side of the hill, where runs the famous Berlin turnpike. The institution consists of the usual combined infirmary and administration building; two shacks, one for men and one for women; a dining hall, a nurses' home and a servants' quarters.

The institution had a somewhat turbulent first year. Its chief troubles were: a sudden failure of its driven well water supply, necessitating the immediate transfer of half its patients to the Meriden Sanatorium; and the expenditure of about ten thousand dollars for securing connection with the Hartford city water system; demonstrations of incapacity by some of the first of its officials and their consequent removal by the Commission; difficulties with refractory patients, and with the sewer system, and with incredibly bad roads.

Until last winter only a few more than half of its 110 beds were occupied, and this small number included those patients who had been returned from Meriden after the correction of the water supply difficulties. There were plenty of patients in and about Hartford and New Britain who needed institutional care, and were anxious to receive it, but the knowledge of the disturbed state of things at the Hartford Sanatorium had spread, and the people were averse to letting their sick friends go there.

The superintendent of the Meriden Sanatorium, Dr. Dinnan, was placed temporarily in charge of the Hartford institution last winter and told to reorganize the staff and the executive management along the lines of the Meriden institution. This he did, and after a few months Dr. Wagner, the chief of staff at the Massachusetts State Sanatorium, at Westfield, was appointed to the superintendency at Hartford.

The results have been gratifying. At present the Hartford institution has more patients than either Meriden or Shelton, and the work is going on with the smoothness and success characteristic of a well-conducted sanatorium. However, it is proper to say here that because of lost case records and uncertain bookkeeping, the report that Dr. Wagner now makes of that troublous first year, although the best that he could make, is necessarily incomplete, and contains figures that are estimates rather than demonstrable statements.

The location of the Hartford Sanatorium is a good one from the point of view of the patient, but from the point of view of the matron in the kitchen, and the grocer and the coal dealer and the ice-man in the city, it is very bad. It is six miles from Hartford, and the approach to it from the Berlin turnpike has been very difficult, especially in stormy weather. It was the intention of the Commission to build a good straight road from the turnpike through the marsh and up the hill on the line of the water mains, but the estimated cost, some fourteen thousand dollars, frightened us. We have compromised by attempting to improve the condition of one of the old indirect roads at an estimated cost of fifteen hundred dollars.

The primitive sewage system first installed at the Hartford institution has been given up and a modern scientific method substituted under the supervision of the engineering firm of Ford, Buck & Sheldon. So successful has this substitution been that these same engineers were authorized to put in the same system at the new institution at Norwich.

It would seem, therefore, that the Hartford institution has all or most of its troubles behind it, and that for the future it will keep step with its sister institutions.

The principal additions made to the Hartford institution during the year were: the connection with the Hartford city water system; the erection and furnishing of a nurses' home; the erection of a barn; the enlarging of the ice-box; the installing of a bake-oven, a dish-washing machine, a potato-paring machine in the kitchen, and a safe in the office; the screening of the infirmary; the purchase of two horses, a farm wagon, an express wagon, a surrey and a Concord wagon; the renovation and refurnishing of the superintendent's quarters; the equipment of a bacteriological laboratory and of a nose-and-throat operating room; partial clearing of the woods, and the building of a good rock-bed road across the grounds.

The needs of the institution are: a cottage for the superintendent; a recreation hall for the ambulant cases; a combination building for morgue and laboratory and disinfecting chamber; the enlargement of the administration building and infirmary, and of all the locker rooms; the screening of the shacks; hogs to consume the boiled garbage; a farmer to put the unused twelve acres under cultivation, and finally, a central heating plant which, to use the words of the superintendent, Dr. Wagner, "would make us an independent community as regards light, and would furnish power for a laundry and for a refrigerating room, and would run the potato-paring machine, the dish-washing machine and the meat-grinders, and would furnish heat for the institution without materially increasing the amount of coal at present consumed by the various furnaces."

NORWICH.

In seeking a site for the proposed State Sanatorium in New London County, the Commission was mindful of the need of securing one that would be beyond the reach of the morning river mists, one that would nevertheless retain a view of the glory of the great Thames Valley, one that would be accessible to the whole eastern part of the State, one that would be in touch with established water and lighting systems, and one that had a southern exposure suitable for building purposes.

Many trips were made by the Commissioners through the county, and many proffered farms examined. In November, 1911, the Post farm, situated near Norwich, west of the Thames, and on the New London turnpike, was bought for nine thousand, five hundred dollars. This purchase soon led us into a sharp controversy with prominent citizens of Norwich. The Board of Trade of that city was induced to send us an official protest against the location of the sanatorium on the Post farm. The Board of Trade went so far as to offer to buy the Post farm from the State, and to give in exchange, property in the vicinity of Norwich, that it felt certain it could persuade the Commission was worth more intrinsically, as well as for the purposes of the State. The Commission gave a hearing on the matter to a committee of the Board of Trade and to other citizens of Norwich, and received communications pro and con on the subject from the officers of various local societies and institutions, and finally visited the farm that it was proposed to exchange for the Post farm. The decision of the Commission was to adhere to its original opinion that there was no other available site near Norwich that was as desirable as the Post farm. The Board of Trade and the people of Norwich were so notified, and it is only fair to say that the Board of Trade and the people of Norwich received the decision in good spirit, and that they have given the Commission loyal, even enthusiastic support ever since.

The plans for the buildings were drawn by the architects Smith and Bassette, of Hartford. The contract was awarded to A. N. Carpenter, of Norwich. His bid and that of Tracy Brothers, of Waterbury, were exactly the same. The bid of Mr. Carpenter was elected simply because his was a local Norwich firm.

The Norwich Sanatorium is designed to care for ninety-six patients, forty-eight of the third stage, male and female, in the infirmary, and twenty-four early cases in each of the two shacks, one for men and one for women. In many ways the accommodations will be superior to that afforded by any of the older institutions. It is now expected that the buildings will be ready for occupants during the coming month of February.

The New London and Norwich trolley line passes in front of the sanatorium grounds. Norwich city water is piped to all of the buildings. The trolley company supplies the institution with electric light. The buildings are within easy reach of the Norwich fire department. All summer long, throngs of Sunday visitors, attracted by the graceful lines of the new buildings, visible for miles from both sides of the river, have visited the sanatorium and expressed their approval of the location and of the progress of the work. The sanatorium is of easy access to every community in New London, Tolland and Windham Counties. The plans for the buildings embody many new ideas and a great many improved old ideas, and are the result of careful study of the demands of the situation by the architects and the Commission, and particularly by the recently deceased chairman of the Commission, Dr. George H. Knight. Dr. Knight was very proud of the completed plans, and he watched the growth of the new buildings with a keen, almost boyish enthusiasm. "The Norwich Sanatorium will be our best monument," he said repeatedly at the meetings of the Commission during the past year.

THE NAMES OF THE INSTITUTIONS.

In most of the statutes heretofore enacted concerning the establishment and conducting of the State's institutions for the care of her tuberculous citizens, these institutions are called County Homes. As a matter of fact they are not county institutions at all. They are State institutions. The counties, as counties, have nothing to do with them, and never have had anything to do with them. The retention of the names of County Homes in the law is not only a verbal inaccuracy, but it is the cause of misunderstanding by town authorities and by local tuberculosis societies, and it engenders friction between the directors of the State's institutions and the enthusiastic physicians and real estate dealers who desire the erection of new sanatoria in parts of the State where they are not needed, or where the topographical or other conditions are unsuitable.

The explanation of this designation of the State's sanatoria as County Homes is as follows: The first conclusions of the original Tuberculosis Commission—the Commission appointed by Governor Woodruff to advise the Legislature as to the measures it ought to take to stamp out tuberculosis in Connecticut—were that the State should command every county in the State to erect a sanatorium where the consumptives of that county could be cared for. Further discussion of this plan with County Commissioners and with influential men in and out of the Legislature, demonstrated that it was impracticable, and it was agreed on all sides that the only feasible plan was that one which was later adopted, and which put the whole responsibility for the founding and conducting of the sanatoria on the State. Nevertheless, so much had by this time been said and written about County Homes, that the mischievous county idea found expression in the statutes making appropriations for the construction and maintenance of the State's institutions.

The idea was mischievous because:

1. Every county that did not secure a sanatorium, or a promise of a sanatorium, felt that it had a good grievance against the State.

2. It would be a very wasteful use of the State's money to attempt to conduct small sanatoria in the less populous counties: the cost of maintenance would be much greater proportionately in an institution with twenty beds than in one with one hundred and fifty beds. It is the experience everywhere that an institution ought to have at least one hundred beds in order to secure a reasonably economical per capita maintenance. The small institution requires almost the same equipment and staff as the larger one.

3. Connecticut is so small and compact that four properly situated sanatoria would afford easily accessible refuge to every tuberculous citizen of the State.

We would therefore respectfully urge your Honorable Body to amend the present statutes where the words "County Homes" are used, by substituting the words, "State Tuberculosis Sanatoria," and in the enacting of new legislation concerning these institutions to use the words, "State Tuberculosis Sanatoria."

MIDDLESEX.

At the last session of the Legislature the Board of Directors was authorized to build sanatoria in New London and Middlesex Counties. The sanatorium in New London County, we have already said, is now almost finished, but no sanatorium has been built in Middlesex County. No site, even, has been secured in Middlesex County.

"Why not?" you ask. "The money was appropriated, was it not? You endorsed the petition of the people of Middlesex County to the last Legislature for a sanatorium in Middlesex County, did you not?"

Yes, it is true that the money was appropriated and that the Board of Directors endorsed the petition of residents of Middlesex County at the last session of the Legislature; but, (1) this appropriation was also for other purposes, namely, "for sewer systems, sewer beds and roads, and cottages for superintendents at sanatoria already erected or hereafter to be erected"; and (2) later and fuller consideration of the petition of the aforesaid residents of Middlesex County forced us to the conclusion that their claims as to the need of a sanatorium in Middlesex County were not well founded, and that we would not be good stewards of the State if we acquiesced in their desire for a State Sanatorium for consumptives in Middlesex County at the present time.

We have not come to this conclusion suddenly. We have listened carefully to the arguments made in favor of the various sites proposed for the location of a sanatorium in Middlesex County, and have spent many days visiting the various properties offered to the State. The physicians of the county notified us that in their judgment the site selected should be in the environs of Middletown. And, in fact, last Spring, we made what the agent considered a satisfactory offer for one property, the unused Arawana Golf Grounds, of Middletown. More than any other place that we had seen in Middlesex County, it possessed qualifications necessary for a site for a State Sanatorium. No sooner was it known in Middletown that the State was about to purchase the hitherto unsalable golf grounds than one of the prominent citizens of Middlesex County bought the golf grounds and again put them on the market weighted down with a provision that should forever exclude the State from buying it for the purposes of this Commission.

The action of this gentleman was a providential rescue of the Commission from the brink of a great mistake. The erection of a State Sanatorium near Middletown at this time would be a mistake because:

1. The sanatorium at Meriden, which has been taking all the patients it could get from New Haven, Waterbury, Middletown and the other large cities of the center of the state, has many empty beds, more than enough to accommodate all the patients that Middlesex County is likely to send for some time to come. The number of empty beds at the Meriden and the other State Sanatoria will be increased this winter after the opening of the Norwich Sanatorium, and the consequent sending to the Norwich Sanatorium of the patients from the eastern part of the State, now inmates of the other institutions; and with its endowment of more than half a million dollars, New Haven Hospital proposes soon to open a tuberculosis sanatorium near the center of the State that will undoubtedly empty more beds at Meriden.

2. Both the Meriden and Hartford Sanatoria are nearer to Middletown than is the Meriden Sanatorium to New Haven.

The Meriden Sanatorium in particular is readily accessible from Middletown. It is less than twelve miles away on direct trolley lines.

3. In all Middlesex County, despite its bewitching beauty, and the attractions it offers in many ways for other institutions and for homes for healthy men and women, there is not a site so suitable for a general tuberculosis sanatorium as is that occupied by the Meriden Sanatorium.

SEASIDE SANATORIA.

The statute ordaining the erection of the tuberculosis sanatoria distinctly specifies that these institutions shall be available for patients suffering from any form of tuberculosis. As a consequence, there are among the hundreds of consumptives at these institutions a few who have only tuberculosis of the bones or the glands. Most parents or other friends of children afflicted with these milder, but still disfiguring and crippling forms of tuberculosis, object to letting the little sufferers go to sanatoria where they would be surrounded with patients suffering from the contagious pulmonary form of tuberculosis. It has long been recognized that whereas many of these cases of bone and glandular tuberculosis show gratifying improvement when they are moved from unhygienic home surroundings, and made to live under proper conditions, preferably in the country, nevertheless, the ideal places for the treatment of these cases are mountain-tops above the cloud lines, and ocean beaches. Connecticut has no mountain-tops above the cloud lines, but she has more than a hundred miles of ocean beach. A dozen of these miles of beach are in Middlesex County.

Here then, we decided, is the solution of our Middlesex County Sanatorium problem—to build a sanatorium on the Middlesex County beach for cases of glandular and bone tuberculosis, and thus comply with both the spirit and the letter of the law. We consulted the Attorney-General to learn whether there was anything in the statutes that could prevent such an interpretation of the law. He assured us that there was not. We proceeded to examine the various stretches of Middlesex County beach that were on the market.

The first suitable place that we tried to buy is in the town of Westbrook, and is partly owned by the town. Aware of the reputation for intelligence and strength of character possessed by the officials and citizens of this old town, we were emboldened to lay the matter frankly before them. We interviewed the Representative, the Selectmen, the Judge of Probate, the physicians of the town and the resident County Commissioner. They all favored the project strongly, and agreed to urge it before the next town meeting, and to notify the State Commission when that meeting was to be held in order that one of the Commissioners might be present to explain that the proposed institution was to care for forms of tuberculosis from which there could not possibly be any danger of contagion, and to describe the similar institutions on the crowded Coney Island beach in New York State, and on other popular beaches in America and Europe.

Some days later there appeared in the newspapers a description of a Westbrook town meeting, to which the Commissioners had not been invited, but at which were many alien summer cottagers, and at which it was unanimously voted to oppose the erection of the proposed institution in the town of Westbrook.

Then we tried for sites in the town of Clinton. The first place that we considered favorably was promptly bought up by a syndicate, in order to prevent the State from securing it. The next and the best place for our purpose on the whole Middlesex County beach, a place that we had great hopes of getting because its owner is a far-seeing and large-hearted citizen, has just been denied to us, at least for the present.

THE POWER OF THE SUMMER COTTAGER.

The successful opposition that the summer cottagers have thus far made to the State's efforts to secure a bit of Middlesex County beach for the curing of her crippled children would seem to call for a clearer definition by the Legislature of the State's rights to her water front. It has been suggested to us that if the history of some of these shore towns were properly investigated, it would be found that the State already possesses unsuspected rights to the beaches.

We have not the necessary money, and it is not within our province to engage the towns in a legal battle over their alleged property rights, but it is within our province to say to the Legislature that we consider it an intolerable condition that the little girls and boys of Connecticut, who through no fault of theirs are afflicted with a wasting and incapacitating ailment, and for whom God has provided in their own State an almost certain means of cure or relief, to which they could and should have access fifty-two weeks of the year, are to be deprived entirely of that means of cure, and to be left at home in pain and despair, merely because some summer cottagers, who use the beach for only eight weeks of the year, desire to remain ignorant of other peoples' suffering, or have sordid and unreasoning fears of a depreciation of their property.

If it be thought that the enthusiasm of the Commission for this seaside treatment of surgical tuberculosis is merely a fad of ours, and therefore negligible, we would refer the skeptical to the single resolution adopted by the Surgical Section of the last International Tuberculosis Congress, and just published in the September number of "Tuberculosis," of Berlin. This resolution is in part as follows: "In view of the need there is of treating surgical tuberculosis in special sanatoria, and in view of the success of the seaside treatment of surgical tuberculosis, this Congress solemnly resolves (emet le voeu) that there should be provided for cases of surgical tuberculosis, particularly for surgical tuberculosis in children, special sanatoria on the seacoast; and that the building of these seaside sanatoria should be done on as large a scale as possible, and with as little delay as possible."

THE PREVENTIVE DUTIES OF THE COMMISSION.

One section of the Act establishing this Commission provides that we "shall take measures to cause instruction in all schools of the State in all rules of living that are essential to the suppression of tuberculosis and the maintenance of public health, to that end may publish tracts and leaflets explaining the movement to control tuberculosis and suitable for distribution in schools, stores, factories and places of public gatherings, which tracts and leaflets may be printed by the Board at the expense of the State; provided that the cost of printing and distributing the same is approved by the Board of Control. The Directors shall also encourage the giving of public addresses upon prevention and treatment of tuberculosis; and shall encourage the formation of local organizations to further that end."

Another section provides that "it shall be the duty of the factory inspector to cause to be posted in prominent places in factories and shops such posters as may be supplied for that purpose." In compliance with the requirements of that law the Commission has within the past year supplied to the factory inspector and to the secretary of the State Board of Education more than one hundred and fifty thousand copies of a poster or folder containing in succinct form the rules of living now considered necessary to prevent the taking or the giving of tuberculosis. Not all of these folders were in the English language. According to the demand, they were furnished in French, or German, or Russian, or Italian, or Turkish, or Syrian, or Polish, or Hungarian, or Slavonian, or Bohemian, or Swedish, or Yiddish, or Greek. The factory inspector reports to us that he has supplied these posters in ample amounts to every factory in the State. The secretary of the State Board of Education has sent the folders as well as the copies of the two pamphlets entitled "The Tuberculosis Problem," and "Connecticut, a Doctor of Consumptives," prepared by one of the members of the Commission, to all the school districts under his immediate supervision, and he is now engaged in helping in the distribution of this literature to the other public and private schools of the

State. The above-mentioned pamphlets have been published entire or in part by most of the leading newspapers of the State.

Under the auspices of the Commission many important public addresses have been made in different parts of the State. Among the eminent men who made notable speeches on these occasions were His Excellency, Governor Baldwin, and Ex-Governor Woodruff.

ORGANIZING THE EMPLOYEES OF FACTORIES AND STORES.

Concerning our obligations to "encourage the formation of local organizations to further that end"—that is, "the prevention and treatment of tuberculosis"—we consider that no more efficient method has yet been devised for a manufacturing State like ours than that of the Employees' Anti-Tuberculosis Associations, founded by one of us (Mr. Gunshanan), and now in operation in many parts of the State. This method received a silver medal and honorable mention at the International Congress in Washington, in 1908. In Hartford, Manchester, New Britain, Norwich, Meriden, Waterbury and New Haven there are now flourishing organizations embracing a membership of nearly seventy-five thousand men and women, whose small contributions to their anti-tuberculosis funds make them eager to know and to use the means that modern science offers for the "prevention and treatment of tuberculosis."

In many instances the employers, not from motives of charity, but because of large foresight, have made contributions to the funds of these organizations sometimes equal in amount to the total sums collected from the employees. It is not, however, in the actual relief afforded to their sick shopmates, nor even in the actual improvement of their shop conditions, that the members of these organizations do their most important work. Their most important work is their influence on the whole community. They have transformed themselves from indifferent, perhaps obstructive citizens into apostles of the light, and to the new powers, of which they immediately became possessed, there is no limit.

We speak of this matter somewhat at length because there has been an effort to introduce into the State another system of relief for tuberculous employees. This consists simply in forcing every employer to pay the sanatorium and home expenses of his consumptive employee. It is utterly banal as compared with the Connecticut method. We hope in the coming few years to extend this Connecticut method to every manufacturing town in the State.

DISPENSARIES AND NURSES.

Of course it isn't in manufacturing towns alone that cases of tuberculosis occur, and even in manufacturing towns it isn't alone within the ken of employees that consumption exists, and it is therefore necessary, in order to allow the disease no hidden refuge, that the whole State should be "organized." In one sense, of course, the whole State is organized. The physicians of the State know every family and are more alert every year, and the local health officers exercise more and more influence every year. Nevertheless, it is not only our experience in our larger cities, but the experience of the more wide-awake communities everywhere, that in order to thoroughly cover the tuberculosis field it is necessary to develop a system of tuberculosis dispensaries and to help to increase the numbers and the activities of the Visiting Nurses' Associations. These institutions should be supported by private contributions, but their records and their work should be open to inspection by the State Commission and subject to the Commission's rules for delimiting and correlating the work.

In this way we will be able to keep in touch with most of the open cases of tuberculosis in the State. We will be able to save and help the families of the poor consumptives; we will be able to examine the "contacts," and we will be able to give the consumptive, himself, the best possible chance to return to health and usefulness.

PRIVATE SANATORIA.

The law of the State says that "Sanatoria under private management and receiving State aid shall be inspected semi-annually by the Board of Directors, but the association owning such sanatorium shall maintain the same in good condition and shall assume all responsibility for the executive work thereof."

In compliance with this statute, we have made visits to the Gaylord Farm Sanatorium at Wallingford, and to the Wildwood Sanatorium in Hartford. The latter institution is the property of the Hartford Hospital and accommodates about fifty patients. At the last session of the General Assembly it received an appropriation of $30,000. The Gaylord Farm Sanatorium is the property of the New Haven County Anti-Tuberculosis Association. It received from the last General Assembly an appropriation of $25,000. It accommodates today 72 patients.

Both of these private sanatoria are well managed and do valuable work for the community, and more than repay the State for the appropriations made to them.

TREATMENT AT THE STATE'S SANATORIA.

Living in the open air night and day, resting or exercising according to the prescription of the physician in charge, drinking much milk and eating much food, such is the treatment of the patients at the State Sanatoria. Not only are all nostrums tabooed, but constant pressure is put on the medical staff to cut down to a minimum the administration of drugs and stimulants of all kinds. Tuberculin is used only in selected cases of glandular and bone tuberculosis. Good results have been secured in a few cases with antogenous vaccines. Now that the laboratory equipment is about complete, with capable and enthusiastic physicians in charge, even greater success may be looked for along this new line.

During the past year the repeated systematic microscopic examination of the sputum of all the patients at the sanatoria has been ordered by the Commission, and the order has been obeyed. Many interesting and helpful medical findings were made thereby. Individual clinical thermometers are supplied in all the sanatoria to all the patients. Improvements have been made in the taking and keeping of the medical history of the cases. In the summer of 1911 the infirmary at the Hartford institution was provided with wire fly screens. None of the other buildings at Hartford and none of the buildings at Meriden or Shelton were screened. Theoretically, it may seem absurd to go to such length as we do to persuade consumptives to live in the open air, and then when they take our advice, to wrap about their sleeping quarters copper wire screens. But nobody who saw the misery and dangers that flies and mosquitoes brought to the helpless bed patients at Meriden and Shelton during the days and nights of that summer of 1911, would need to hear any argument on the subject.

SERIOUS SURGICAL OPERATIONS.

In some of the early years of the Commission's work it was the practice to call in outside surgeons to perform any necessary operations at the sanatoria. This practice has been stopped and arrangements have been made with the principal hospitals of the State to receive and treat, at the lowest rates, such patients from the State's Sanatoria as require major operations. The minor surgery is, of course, taken care of by the medical staff of the sanatoria.

THE PURCHASING OF SUPPLIES.

A complaint against the State Sanatoria that every now and then finds its way into the newspapers is that favoritism is shown by the various superintendents in the purchase of supplies, or that purchases are not made from local dealers, or that purchases are made in New York or Boston that could just as well have been made in Connecticut. In a few instances there have been grounds for this last item of complaint, but as a rule, everything that could be bought in Connecticut as cheaply as elsewhere, has been bought here. As to the second item, the superintendents are anxious to be on friendly terms with their neighbors, but they are required by the Commission to get the best prices possible in any market in the State. As to the first item, it is easy to impute base motives, but not always easy to realize the difficulties of so apparently easy a problem as the purchase of supplies. Most of our sanatoria are situated so far from market that many dealers refuse to deliver purchases at the sanatoria. Superintendents frequently find that what one dealer calls prime quality in making bids for trade, is actually inferior to the second quality of another dealer. Again, he learns that one dealer is fair and another tricky. Therefore, though on the face of the figures the superintendent may seem to be buying of the dearer dealer, he may be really getting the better bargain. Like every other purchaser, he must be permitted to make use of his brains and his knowledge of men in victualling his institution. It would not be fair to him or to the State to put him at the mercy of the figures of the unscrupulous dealer. Nevertheless, all the superintendents have recently been instructed to see to it that any and all dealers have an opportunity to bid on the supplies for the various institutions.

UNRULY PATIENTS.

The most difficult disciplinary problem that we have met with in the management of the State Sanatoria is the proper treatment of fractious patients. The man, who for good reason, is permitted to go home for two days, and who remains home a fortnight and returns with great increase of disease in his lungs; and the man, who, though he does not get drunk, persists in drinking large quantities of whiskey that deluded friends bring to him; and the man and woman whose romantic impulses break the rules of the sanatoria and excite the risibilities of the other patients; the man, even, who after a long period of good behavior and improvement, goes to town and is picked up in the road drunk; what shall we do with these people? "Send them home," you say, "the law gives you authority to do so."

Yes. Section 7 reads as follows: "Patients who are of immoral or filthy habits, or who for other good cause, in the opinion of the Board, are unsuitable for association with the inmates of such homes, shall not be received or retained unless separate accommodation is provided for such patients." Yes, we can send these patients home. To keep them would put a great strain on the discipline of the institution. But it must always be borne in mind that the State is bearing the great burden of these sanatoria chiefly in order to protect her healthy citizens, and to send a culpable patient back to his old home or lodging-house is a dangerous thing to do. Again, if he happens to be without friends or means, where can he go? The statutes forbid the town authorities to keep him in any almshouse in the State.

It would seem that sooner or later we must erect a sanatorium specially planned for the reception of consumptives from the jails and prisons, and perhaps the almshouses of the State, and for the segregation of the refractory patients of the other State Sanatoria. Some such institution will be absolutely necessary if we in Connecticut follow the example of those American communities that have given to their health authorities power to forcibly confine in a tuberculosis hospital or sanatorium the refractory tuberculous citizen whose freedom is judged dangerous to the health of his neighbors.

The institutions at present conducted by the State are not equipped for the forcible detention of patients. In fact, the prison atmosphere would blast any of our present sanatoria. None of the better class of patients, none of the gentle women and self-respecting men, who because of their sickness and straitened means are now enjoying the bounty of the State, would remain at an institution that had the reputation of being a place where consumptives were forcibly detained. It may not be necessary to decide this problem just now, but the discussion cannot be postponed indefinitely.

Food Waste.

We have been frequently shocked to see the waste of food that has taken place in the kitchens of our sanatoria. During the past year we have devised several plans to lessen this waste, but still we are far from being satisfied with the situation. The fault doesn't lie with any one official or servant. It lies with the nature of the institution.

The Danger of Fire.

As all the buildings of all the institutions are of wood, the danger of fire is a cause of constant anxiety. A heavy insurance is, of course, carried, but a blaze that would attain any headway on one of our stormy winter nights would quickly devour a whole sanatorium. We have made what provisions we could in the way of patent fire extinguishers, hand and wheel, and stand-pipes and hydrants. Of course, all the stronger patients in the shacks would easily escape from the one or two-story buildings, but the rescue of the bed patients in the infirmaries would not be so easy. At Meriden, where the infirmary houses patients on three floors, we have been constrained to go to the expense of erecting one of the large steel spiral fire-escapes which takes mattress and patient together and shunts them unscathed to the ground.

A Dearth of Woman's Kindness.

In one particular the State's campaign against tuberculosis is weak. The women of the State have not enlisted in sufficient number. Except for the Visiting Nurses' Associations and a few societies of women whose interest in tuberculosis is only incidental, and the women who contribute to the anti-tuberculosis societies of the State, the hundreds of thousands of women of the State have done nothing but sympathize from afar with the State's efforts at relieving the tuberculous sick. At a hint from the Commission a year ago, the Visiting Nurses' Association of New Haven took up the matter of doing what it could toward relieving the loneliness and homesickness of the State's patients; for loneliness and homesickness even the strongest-minded inmate of a sanatorium must occasionally feel. The Visiting Nurses, for instance, saw to it that at Christmas time every patient received a letter or card of good-will, and that at various times in the year, the women patients in particular, were made to realize that there were people in the world who sympathized with them and expected that they would win their fight. Occasionally a church choir, or a few actors and actresses, moved only by their love of their kind, and entirely without solicitation, have appeared at one or other of the sanatoria and made pleasure for the patients. Sometimes a superintendent, emboldened by the reputation of a theatrical manager, has coaxed him into lending a moving-picture show or a couple of vaudeville performers to the sanatorium.

But much of the work that only women can do for such institutions as ours has not been done. The institutions have not been properly "mothered." The women of the State have felt that because these were State institutions, any systematic visiting or inquiring would be considered an intrusion, and that committees or delegations would be no more welcome than they would at a prison or an insane asylum. This feeling is not justified by the facts. Our patients are helped, not hindered by such visiting as they would receive from members of a society of interested ladies. Moreover, the visits of these ladies would keep us, who have charge of the institutions, on our best behavior, and would help us to make the State appreciate the kind of work and the amount of work that the Commission is doing.

We mention this matter here in the hope that the members of the General Assembly will themselves encourage the ladies in their towns to get in touch, and to keep in touch, with the work of the State Tuberculosis Sanatoria at Meriden, Shelton, Hartford and Norwich. And as to the seaside sanatorium—if we could get the organized women of the State to listen with us and with the physicians of the State to the piteous cry of the crippled children of the State, we would soon have behind us an irresistible force of public opinion, and within a year, on some short stretch of her shining ocean beach, Connecticut would be proudly housing and curing her white-faced, twisted and limping little ones.

RECOMMENDATIONS.

The section of the statute that requires us to make a biennial report of our work to the General Assembly enjoins the Board to "include in said report such recommendations for the further development of the work of the Board as it may deem advisable." We have already specified the needs of the various sanatoria, and told of the desirability of changing the names of the institutions from County Homes to State Sanatoria, and of the importance of the work of a small seaside sanatorium for cases of bone and glandular tuberculosis. To refer again to this last matter, we would ask that authority be given to us to establish this institution on whatever point of the Connecticut shore we find most suitable, and that we no longer be confined to a consideration of the Middlesex County Beach.

In view of the growing size and importance of the work of the Board, we would urge that a sufficient sum be appropriated for office expenses. At present, when some ordinary office expense is incurred, such as the employing of a stenographer or the purchase of postage stamps, the cost must be added to the maintenance accounts of the various sanatoria.

NO CONSUMPTIVES IN ALMSHOUSES.

Another section of the law governing the work of this Commission is as follows:

"SECTION 4. No person having tuberculosis shall be allowed to remain in any almshouse or county temporary home, and it shall be the duty of the selectmen or the persons having supervision of such almshouse to cause the inmates thereof to be examined by a reputable physician at least once every six months, and the county commissioners in each county shall cause like examinations to be made of the inmates of the county temporary home, and all persons found infected with tuberculosis shall be removed, as soon as possible, by the selectmen or the county commissioners, as the case may be, to a county home for tuberculosis patients. On or before June thirtieth and December thirty-first in each year, the first selectmen of each town, or the official having supervision of the town almshouse in towns in which such supervision does not devolve upon the selectmen, and the county commissioners of each county, shall file with said Board a sworn statement setting forth that the examination required by this section has been made, and if any inmate is found to be infected with tuberculosis, stating the name and age of such person. If such statement is not filed as aforesaid, said board shall, as soon as practicable after the expiration of the time for filing the same, cause said examination to be made, by a physician designated by said board, of the inmates in the almshouse in the town the first selectmen or other proper authority of which have failed to file such statement, or of the inmates of the temporary home in any county the county commissioners of which have failed to file such statement, and the expenses thereof shall be paid by such town or county."

To all the town and county officials concerned with the enforcement of this part of the statute, one, and to some of these officials, two notices of the requirements of the law were sent by the secretary of the Commission, and practically all of these officials have done their duty in the premises. The few who have been dilatory or who have misconceived the meaning of the statute will be more rigorously dealt with after the time for the next reporting expires, on December 31st.

THE COST.

It was the plain intention of the last General Assembly to be generous in its appropriations to the work of the State Tuberculosis Commission. The Chairman of the Commission, Dr. Knight, who was also an important member of the House, was asked by his fellow members of the Assembly to specify the sums of money that he considered necessary for the work of the Commission for the coming two years, and necessary to wipe out the deficit in the accounts of the preceding two years.

As the result of the estimates submitted by Dr. Knight, the Legislature appropriated $50,000 to cover the deficit and to pay the expense of connecting the Hartford Sanatorium with the Hartford city water system, and $400,000 for future maintenance and construction.

When the Comptroller's books were closed on September 30, 1911, the $50,000 deficit appropriation was entirely expended with the exception of the $8,000 for the water supply at the Hartford County Home, which amount was paid in the spring of 1912, and while showing in the accounts of the fiscal year ending September 30, 1912, was charged to the proper appropriation. Therefore, we commenced our year's work, October 1, 1911, with the two appropriations:

Maintenance	$250,000	
Construction	150,000	
		$400,000

In October, 1911, the Commission gave the Comptroller bills in the amount of $8,945.54, which they had charged to the accounts for the year ending September 30, 1911, and which it was necessary for the Comptroller to pay out of the new appropriation. We find that the Comptroller has spent for tuberculosis work during the fiscal year ending September 30, 1912, $338,927.37, $32,999.88 of which is not chargeable to the above appropriation. It is not required by law that the Comptroller report on the amount expended on various appropriations, but he does report on the amount paid for certain work during a fiscal year. Therefore, in his report of September 30, 1912, he included money paid to other than State institutions, i. e., to Hartford Hospital for Wildwood Sanatorium, and to the New Haven Anti-Tuberculosis Association for Gaylord Farm.

Deducting the amount paid for

Hartford Water Supply	$8,000.00	
Auditor's Expenses	383.04	
And other Hospitals	24,616.84	
		$32,999.88

from the $338,927.37 reported by the Comptroller, we find that on October 1, 1912, he had expended $305,927.49, which left us a balance of $94,072.51.

Deducting $23,460.61, the amount due for work contracted for and not yet finished; and deducting also $45,000 representing approximately the amount due for the unpaid and unreceived bills of the past year, the usable balance to the credit of the Commission in the Comptroller's hands is reduced to about $25,000. To this sum, however, should be added a working balance to the credit of the Commission in the Middletown National Bank, and the First National Bank of Middletown, $42,157.57. The Commission therefore has to face the work of the coming year with a capital of a little more than $65,000. The inadequacy of this sum will force the Commission to appear early in the coming session of the General Assembly to ask for an emergency maintenance appropriation.

The reasons for this expenditure of more money than was allowed by the estimates of two years ago are:

1. We have had during the past year more patients than in 1911 we expected to have.
2. We have been obliged to do more conservative construction and equipment at the old institutions than we could foresee two years ago.
3. We have been obliged to pay more for labor than seemed likely two years ago.
4. We have been obliged to pay more for food than even the most cynical experts foresaw two years ago.
5. We have been obliged, because of the prevalent high prices of everything, to pay much more for our bidded construction work than we expected to pay two years ago.

SANATORIUM EMPLOYEES.

In compliance with Section 185 of the General Statutes, we append the following list of employees at the various sanatoria, whose compensation is not less than $450.00 per annum:

MERIDEN SANATORIUM.

Superintendent, $1,800.00, with board for self and family.

Assistant superintendent, $900.00, with board for self and family.

Head nurse, $720.00, with board.
One nurse, $600.00, with board.
One nurse, $540.00, with board.
Nine nurses, $480.00, with board.
Housekeeper, $600.00, with board.
Bookkeeper, $480.00, with board.
Stock clerk, $480.00, with board.
Chief cook, $840.00, with board.
Assistant cook, $480.00, with board.
Carpenter and builder, $1,170.00, without board.
Yardman and barber, $728.00, without board.
Two yardmen, $676.00, without board.

HARTFORD SANATORIUM.

Superintendent, $1,500.00, with board for self and family.

Assistant superintendent, $900.00, with board for self and family.

Head nurse, $720.00, with board.
Five nurses, $480.00, with board.
Housekeeper, $720.00, with board.
Engineer, $540.00, with board.
Baker, $600.00, with board.
Bookkeeper, $480.00, with board.
Cook, $600.00, with board.
Cook, $540.00, with board.
Storekeeper, $480.00, with board.
Night watchman, $480.00, with board.
Carpenter, $480.00, with board.

SHELTON SANATORIUM.

Superintendent, $1,800.00, with board for self and family.

Assistant superintendent, $900.00, with board for self and family.

Head nurse, $600.00, with board.
Housekeeper, $480.00, with board.

Nine nurses, $480.00, with board.
Two cooks, $480.00, with board.
Fireman, $600.00, with board.
Farmer, $480.00, with board.
Watchman, $639.00, with board.
Bookkeeper, $480.00, with board.

NORWICH SANATORIUM.

Superintendent, $1,500.00, with board.
Farmer, $480.00, with board.

MERIDEN SANATORIUM.
New Shack for Women.

MERIDEN SANATORIUM.
Superintendent's Cottage.

REPORT OF MERIDEN SANATORIUM.

DR. J. B. DINNAN,	*Superintendent*
DR. H. ST. JOHN WILLIAMS,	*Assistant Superintendent*
MISS MAUDE WHITE,	*Head Nurse*
MISS JULIA L. CUMMINGS,	*Secretary*
MISS HANNAH HOWARD,	*Housekeeper*
ALVA GRAVELINE,	*Chief Engineer*

Financial and Medical Report of the State Tuberculosis Sanatorium at Meriden

FROM OCTOBER 1, 1910 TO SEPTEMBER 30, 1911
AND FROM OCTOBER 1, 1911 TO SEPTEMBER 30, 1912.

DR. J. B. DINNAN, *Superintendent.*

REPORT FOR YEARS ENDING SEPTEMBER 30, 1911 AND SEPTEMBER 30, 1912.

CASH ACCOUNT.

Institution Receipts:	Year 1910-11	1911-12	
Board of patients:			
Towns,	$11,615 65	$16,213 14	
Associations,	3,876 19	2,464 44	
Private,	2,296 53	2,496 58	
State,		31 85	
	$17,788 37	$21,206 01	
Total receipts for Board, October 1, 1910—September 30, 1912,			$38,994 38
Miscellaneous receipts:	Year 1910-11	1911-12	
Clothing, etc.,		$29 63	
Telephone and stamps,	$19 65	110 77	
	$19 65	$140 40	
Total miscellaneous receipts, October 1, 1910—September 30, 1912,			$160 05
To bills of institution paid by State Tuberculosis Commision:			
	Year 1910-11	1911-12	
Construction,	$10,548 32	$46,630 74	
Equipment,	2,050 52	8,073 66	
Maintenance,	50,816 03	64,842 18	
	$63,414 87	$119,546 58	
Total of all bills paid by State Tuberculosis Commission, October 1, 1910—September 30, 1912,			$182,961 45
Total receipts from all sources,			$222,115 88

PAYMENTS.

	Year 1910-11	1911-12	
To Secretary of State Tuberculosis Commission, . .	$16,000 00	$21,500 00	
Sundries account:			
Stamps, freight, express and carfare, ...	417 40	746 17	
Bills paid by checks of State Tuberculosis Commission,	63,414 87	119,546 58	
Cash book balance, October 1, 1912, ...		490 86	
	$79,832 27	$142,283 61	
Total expenditures October 1, 1910—September 30, 1912,			$222,115 88

RESOURCES AND LIABILITIES.

Resources.

Cash on hand October 1st., ...	$112 08	
Balance in bank, ...	378 78	
Bills due from towns and cities (Patients' board),	1,369 99	
Bills due from associations, ...	819 55	
Bills due from individuals, ...	659 07	
Bills due for State cases, ...	29 14	
Bills due October 1, 1911, still unpaid, . . .	1,260 32	
		$4,628 93

Liabilities.

Due State Tuberculosis Commission from institution as per resources, ...	$4,628 93

ANALYSIS OF EXPENSES.

Construction account, including new buildings and improvements on buildings and grounds:

	Year 1910-11	1911-12	
Lumber, ...	$280 26	$616 76	
Hardware, ...	241 75	368 94	
Painting, ...	50 10	2,028 05	
Yard grading and sewer,	2,471 15	469 59	
Plumbing, ...	1,485 97	4,131 07	
Electrical work, . . .	146 39	1,655 95	
Advertising bids, . .	64 80	126 29	
Superintendent's cottage,	3,211 35		
Plans and specifications,	321 00	1,641 62	
Nurses' home and stable,		18,186 84	
Passage way and shed, .		1,528 00	
Women's shack, . . .		8,395 00	
Water tank, ...		1,000 00	
Eavestroughs, . . .		90 00	
Mason work on yard and walls, ...		2,543 65	
Refrigerator, ...		1,048 00	
Construction payroll, .	2,275 55	2,800 98	
	$10,548 32	$46,630 74	
Total, ...			$57,179 06

Equipment, not including replacement of any kind:

	Year 1910-11	1911-12	
Furniture,	$889 82	$1,421 34	
Awnings and screens,	486 71	2,028 60	
Fur coats,	451 15	451 15	
Laboratory supplies,	125 84	138 82	
Telephone installed,	19 00	237 98	
Sterilizer,	80 00		
Blankets,		350 00	
Baking oven,		60 00	
Water pump,		129 45	
Potato-peeler,		45 00	
Dishwasher,		245 00	
Safe,		90 00	
Incinerator,		420 00	
Horses,		505 00	
Harnesses,		108 00	
Wagons,		162 00	
Coupe,		165 00	
Kitchen utensils,		315 77	
Fire extinguishers and escape,		930 00	
Staff and waiters' suits,		122 85	
Sheets for nurses' home,		147 70	
	$2,050 52	$8,073 66	
Total,			$10,124 18

MAINTENANCE.

	Year 1910-11	1911-12	
Salaries, wages and labor:			
Medical service, including nursing,	$8,277 06	$8,742 04	
Office salary,	295 00	405 00	
General help, including kitchen service,	4,986 09	6,599 85	
	$13,558 15	$15,746 89	
Total,			$29,305 04
	Year 1910-11	1911-12	
Food:			
Milk,	$6,459 72	$6,461 66	
Eggs,	1,499 70	4,023 48	
Coffee,	272 64	469 18	
Tea,	61 16	135 66	
Amounts carried forward,	$8,293 22	$11,089 98	$29,305 04

	Year 1910-11	1911-12	
Amounts brought forward,	$8,293 22	$11,089 98	$29,305 04
Meat,	6,163 68	10,425 74	
Fish,	625 31	596 35	
Flour,	290 84	567 50	
Fruit and vegetables,	792 63	683 25	
Sugar,	263 71	314 74	
Groceries,	4,185 24	3,300 14	
Butter,	1,192 52	2,094 95	
Ice Cream,	145 03	309 01	
Tobacco,	73 03	229 00	
	$22,025 21	$29,610 66	
Total,			$51,635 87
Clothing and material:	Year 1910-11	1911-12	
Clothing, boots, shoes, rubbers and repairs,	$295 15	$258 92	
Dry goods,	911 10	871 97	
	$1,206 25	$1,130 89	
Total,			$2,337 14
Heat, light, power and ice:	Year 1910-11	1911-12	
Ice,	$458 91	$550 13	
Light,	840 37	1,694 48	
Fuel,	2,058 99	4,690 94	
	$3,358 27	$6,935 55	
Total,			$10,293 82
Drugs and hospital supplies:	Year 1910-11	1911-12	
Drugs,	$2,540 49	$1,763 65	
Hospital supplies,	1,299 31	1,884 57	
	$3,839 80	$3,648 22	
Total,			$7,488 02
Miscellaneous:	Year 1910-11	1911-12	
Periodicals, stationery, office and ward supplies, office expenses,	$632 20	$734 85	
Barn expense,	422 76	1,096 27	
Telephone service,	214 67	387 94	
Insurance,	234 88	333 78	
Nurses' board, medical service and dentist,	277 80	35 98	
Laundry,	2,800 20	3,302 10	
Freight transportation and expressage,	988 77	840 79	
Crockery, cutlery and sundries,	841 47	666 70	
Water rent,	50 00	100 00	
Hartford office expense,	345 40	394 03	
Kitchen utensils,	20 20		
Funeral expenses,	20 00		
	$6,828 35	$7,769 97	
Total,			$14,598 32
Total expenses for maintenance,			$115,658 21

MERIDEN SANATORIUM
New Nurses' Home

MAINTENANCE RESOURCES

Goods on hand:		
Fuel,	$1,985 71	
Stock room inventory,	844 88	
Drug inventory,	136 70	
Total		$2,967 29

PER CAPITA.

Recapitulation and per capita:	Year 1910-11	1911-12
Total expenses of maintenance,	$50,816 03	$61,874 89
Total number of hospital days,	36,072	38,741
Cost per patient per day,	$1 408	$1 59
Cost per patient per week,	9 856	11 13
Average for two years,		10 50

VALUATIONS.

Twenty-eight and a quarter acres land,	$4,235 00	
Infirmary building with connecting passageway,	24,657 30	
Two-story forty-bed shack, Dining hall and shack,	12,060 00	
Temporary portable shack,	1,255 70	
One-story twenty-four bed shack,	8,500 00	
Nurses' home,	20,000 00	
Barn,	2,000 00	
Superintendent's cottage,	3,211 00	
Incinerator building and contents,	500 00	
Workshop,	60 00	
Horses, carriages, wagons and harnesses,	1,225 00	
Beds and bedding,	3,475 00	
Towels, table linen and dry goods,	115 00	
Fire escape,	750 00	
Furniture,	2,730 00	
Drugs,	137 00	
Food supplies on hand,	845 00	
Fuel on hand,	1,986 00	
Fur coats,	900 00	
Kitchen utensils, dishes and crockery,	1,118 00	
Screens and awnings,	2,500 00	
		$92,260 00

TABLE 1.

	Males	Females	Totals
Number of patients in sanatorium Oct. 1, 1910, .	50	18	68
Number of patients admitted Sept. 30, 1910, to Oct. 1, 1911, ...	175	88	263
Number of Patients discharged Sept. 30, 1910, to Oct. 1, 1911, ...	80	49	129
Number of patients died Sept. 30, 1910, to Oct. 1, 1911, ...	54	36	90
Number remaining Oct. 1, 1911, ...	91	21	112
Number admitted Sept. 30, 1911, to Oct. 1, 1912, .	219	64	283
Number of patients discharged Sept. 30, 1911, to Oct. 1, 1912, ...	149	31	180
Number of patients died Sept. 30, 1911, to Oct. 1, 1912, ...	87	20	107
Total admissions Oct. 1, 1910, to Oct. 1, 1912, . .	394	152	546
Total discharges Oct. 1, 1910, to Oct. 1, 1912, . .	229	80	309
Total died not included in discharges Oct. 1, 1910, to Oct. 1, 1912, ...	141	56	197
Number patients remaining Oct. 1, 1912, . . .	74	34	108

Monthly Admission and Discharges with Average Daily Census and Total Number of Hospital Days.

Month in Sanatorium	Admitted			Discharged			Daily Average	Hospital Days
	Male	Female	Total	Male	Female	Total		
In sanatorium, 1910.	50	18	68					
October, ...	24	25	49	8	7	15	$74\frac{28}{31}$	2,322
November, . . .	5	6	11	10	10	20	97	2,902
December, . . .	17	6	23	3	6	9	92	2,846
1911 January, ...	19	8	27	4	2	6	96	2,980
February,. . . .	15	3	18	5	1	6	103	2,880
March, ...	7	8	15	7	3	10	105	3,253
April, ...	8	4	12	3	2	5	103	3,084
May, ...	11	10	21	6	4	10	105	3,264
June, ...	6	9	15	13	3	16	102	3,059
July, ...	18	3	21	2	2	4	100	3,101
August, ...	21	4	25	10	4	14	103	3,200
September, . . .	24	2	26	9	5	14	106	3,180
Total for fiscal year,	175	88	263	80	49	129	90	36,072
In sanatorium, 1911.	101	26	127					
October, ...	17	3	20	22	8	30	103	3,182
November, . . .	18	6	24	6	0	6	98	2,937
December, . . .	21	2	23	3	1	4	113	3,397
1912 January, ...	23	2	25	12	0	12	110	3,381
February,. . . .	14	6	20	8	2	10	104	3,013
March, ...	15	4	19	14	3	17	106	3,270
April, ...	11	8	19	10	2	12	105	3,151
May, ...	19	8	27	9	4	13	107	3,329
June, ...	17	1	18	17	4	21	100	3,101
July, ...	32	9	41	13	0	13	113	3,510
August, ...	15	8	23	16	2	18	106	3,297
September, . . .	17	7	24	12	5	17	106	3,173
Total for fiscal year,	219	64	283	149	31	180	106	38,741
Total for two years,	394	152	546	211	74	285	98	74,813

Patients died not included in discharges, 197.

Admittances.

	Sept. 30, 1910, to Oct. 1, 1911			Sept. 30, 1911, to Oct. 1, 1912			
	Male	Female	Total	Male	Female	Total	2 years Totals
Early,	17	6	23	27	9	36	59
Moderately advanced,	59	22	81	123	36	159	240
Advanced,	103	53	156	68	20	88	244
No record,			3				3

Discharges.

	Sept. 30, 1910, to Oct. 1, 1911			Sept. 30, 1911, to Oct. 1, 1912			
	Male	Female	Total	Male	Female	Total	2 years Totals
Apparently arrested,	8	4	12	12	5	17	29
Improved,	84	27	111	105	30	135	246
Not improved,	30	17	47	15	9	24	71
Died,	54	36	90	87	20	107	197
No record,			3				3

Transferred from other State Sanatoria, records not here, 27.

Civil Condition of Patients Admitted.

	Males	Females	Totals
Single,	220	70	290
Married,	158	59	217
Widowed,	18	18	36
Divorced,	1	2	3
	397	149	546

Age of Patients Admitted, September 30, 1910 *to October* 1, 1912.

	Males	Females	Totals
Under 14 years,	11	14	25
14 to 20 years,	54	26	80
20 to 30 years,	101	51	152
30 to 40 years,	100	35	135
40 to 50 years,	87	12	99
50 to 60 years,	36	6	42
Over 60 years,	8	5	13
	397	149	546

Nativity of Patients Admitted, September 30, 1910 *to October* 1, 1912.

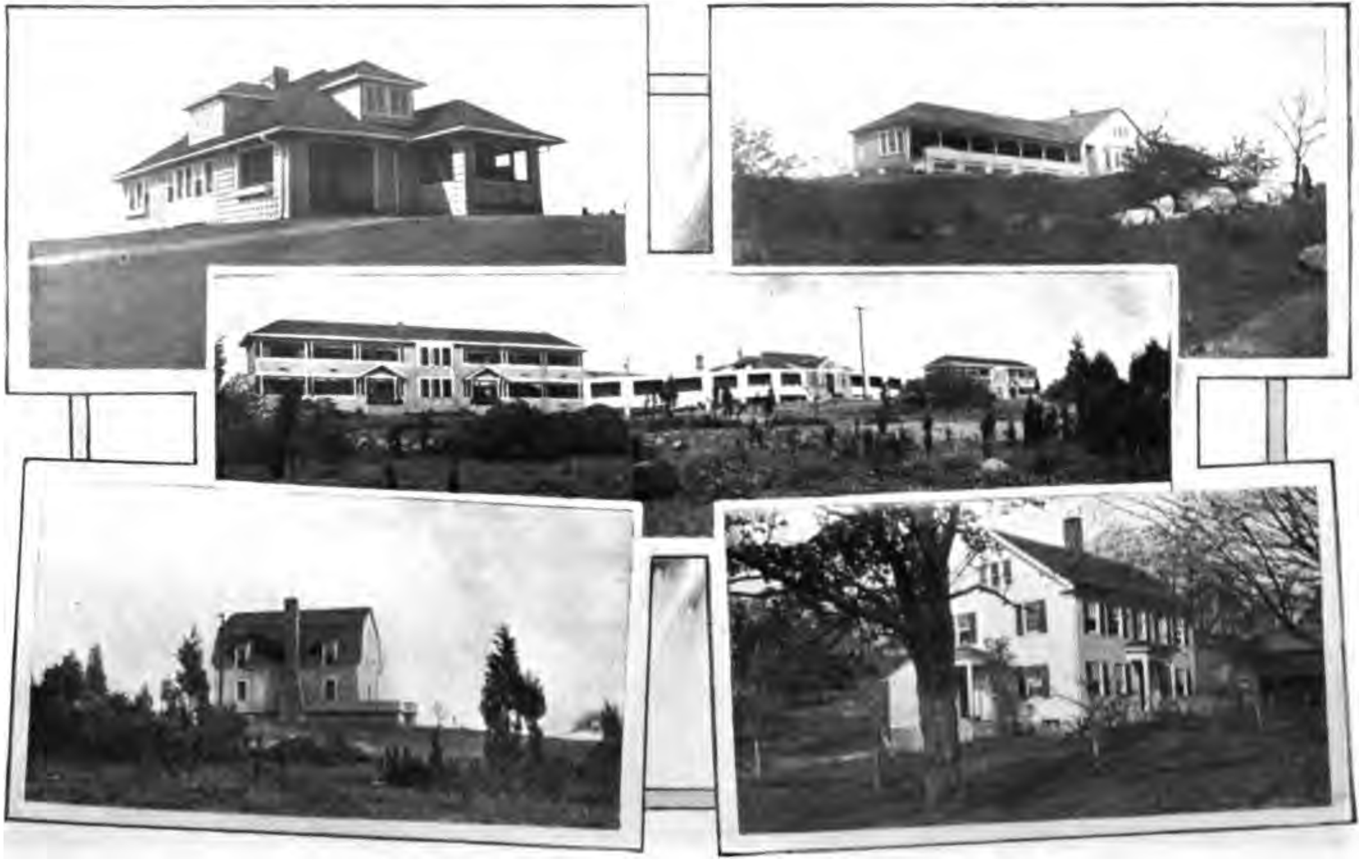
	Males	Females	Totals
Armenia,	1	0	1
Africa,	1	0	1
Bavaria,	1	0	1
Canada,	6	3	9
Denmark,	1	0	1
England,	1	2	3
France,	3	2	5
Germany,	13	4	17
Greece,	1	0	1
Hungary,	20	9	29
Ireland,	91	28	119
Italy,	26	12	38
Russia,	31	13	44
Sweden,	20	11	31
Scotland,	2	1	3
Switzerland,	1	0	1
United States,	178	64	242
Total,	397	149	546

Residence of Patients Admitted, September 30, 1910 *to October* 1, 1912.

Town	Male	Female	Total	Town	Male	Female	Total
Ansonia, . . .	2	0	2	Middletown, . . .	1	0	1
Blackhall, . . .	1	1	2	Moosup, ...	1	2	3
Berlin, ...	0	1	1	Naugatuck, . . .	4	3	7
Bloomfield, . .	1	0	1	Newtown, ...	0	1	1
Branford, . . .	2	2	4	New Britain, . . .	13	3	16
Bridgeport, . .	13	3	16	New Haven, . . .	159	32	191
Bristol, . . .	0	2	2	Norwich, ...	9	7	16
Colchester, . .	0	1	1	Norwalk, ...	1	1	2
Cromwell, . . .	0	1	1	Orange, ...	1	0	1
Danbury, . . .	1	0	1	Old Saybrook, . . .	1	0	1
Danielson, . . .	1	0	1	Portland, ...	3	1	4
Derby, ...	0	1	1	Prospect, ...	1	0	1
Eagleville, . . .	1	0	1	Rockville, ...	1	0	1
East Hampton, .	2	0	2	South Norwalk, . .	6	1	7
Essex, ...	1	0	1	Southington, . . .	2	2	4
Farmington, . .	1	0	1	Stony Creek, . . .	1	2	3
Guilford, . . .	1	0	1	Suffield, ...	0	1	1
Glastonbury, . .	2	0	2	Terryville, . . .	2	0	2
Groversville, . .	0	1	1	Thomaston, ...	1	1	2
Haddam, . . .	3	1	4	Thompsonville, . . .	3	0	3
Hamden, . . .	2	3	5	Torrington, ...	2	0	2
Hartford, . . .	28	11	39	Union City, ...	1	0	1
Higganum, . .	2	0	2	Waterbury, ...	62	28	90
Kensington, . .	0	1	1	Wallingford, . . .	10	4	14
Madison, . . .	1	0	1	Washington,. . . .	0	1	1
Meriden, . . .	34	18	52	Watertown, ...	0	1	1
Middlebury, . .	1	0	1	Waterville, ...	1	0	1
Marion,. . . .	1	0	1	Whitneyville, . . .	1	0	1
Middlefield, . .	1	0	1	Willimantic, . . .	2	1	3
				Woodbridge, . . .	2	0	2

Occupations.

	Male	Female	Total		Male	Female	Total
Auto. trimmer, .	2	0	2	Japaner, ...	3	0	3
Artist, ...	0	1	1	Jewelry maker, . .	3	0	3
Actor, ...	1	0	1	Laundry, . . .	0	1	1
Baker, ...	1	0	1	Laborer, ...	35	0	35
Bookbinder, . .	1	0	1	Longshoreman, . .	2	0	2
Buffer, ...	10	0	10	Machinist, . . .	31	0	31
Bone carver, . .	1	0	1	Merchants, . . .	1	0	1
Barber, . . .	7	0	7	Motorman . . .	2	0	2
Butcher, . . .	3	0	3	Moulders,. . . .	14	0	14
Bartender, . .	10	0	10	Nurse, ...	0	1	1
Blacksmith, . .	6	0	6	No occupation, . .	6	4	10
Box maker, . .	2	0	2	Painter, ...	11	0	11
Bricklayer, . .	2	0	2	Plater, ...	4	0	4
Brass worker, . .	15	2	17	Paper glazier, . .	2	0	2
Cabinet maker, .	1	0	1	Polisher, . . .	10	0	10
Carriage maker, .	1	0	1	Plumber,. . . .	7	0	7
Chauffeur, . . .	2	0	2	Peddler, ...	8	0	8
Corset maker, . .	2	1	3	Plasterer, . . .	2	0	2
Carpenter, . . .	10	0	10	Roofer, ...	1	0	1
Cigar maker, . .	3	1	4	Rubber workers, .	10	0	10
Clerks, . . .	12	12	24	Railroad workers, .	3	0	3
Cooks, ...	6	1	7	Seaman, ...	1	0	1
Dressmakers, . .	0	3	3	Shop workers, . .	28	10	38
Drivers, . . .	18	0	18	Shoemakers, . .	5	0	5
Electricians, . .	2	0	2	Students, . . .	10	13	23
Fire gilder,. . .	1	0	1	Salesman, . . .	3	1	4
Fireman, . . .	2	0	2	Tailors, ...	6	0	6
Farmer, . . .	6	0	6	Teachers, . . .	2	0	2
Gun maker, . .	2	0	2	Typesetter, . . .	3	0	3
Glass cutter, . .	3	0	3	Toolmaker, . . .	4	0	4
Grinder, . . .	2	0	2	Upholsterer, . .	4	0	4
Harness maker, .	2	0	2	Waiter, . . .	4	0	4
Hatter, . . .	2	0	2	Weaver, . . .	6	3	9
Housekeepers, .	2	91	93	Watchman, . . .	5	0	5



SHELTON SANATORIUM.
Top Left Superintendent's Cottage. Top Right- New Shack for Women.
Center—Shacks and Dining Hall. Lower Left Nurses' Home. Lower Right Farm House.

REPORT OF SHELTON SANATORIUM.

DR. WM. H. STOCKWELL,	*Superintendent*
DR. EDWARD J. LYNCH,	*Assistant Superintendent*
MISS EDITH KNIGHT,	*Head Nurse*
MISS JENNY H. LEE,	*Secretary*
MRS. J. J. LAMB,	*Housekeeper*
MICHAEL J. STANTON,	*Chief Engineer*

Financial and Medical Report of Shelton Sanatorium

FROM OCTOBER 1, 1910 TO OCTOBER 1, 1911
AND FROM OCTOBER 1, 1911 TO OCTOBER 1, 1912.

DR. WILLIAM M. STOCKWELL, *Superintendent.*

Maintenance Account Fairfield County Home, from October 1, 1910 to October 1, 1911.

ANALYSIS OF EXPENSES.

Average number of patients per day,		58.6
Salaries and payroll,		$11,133 05
Food:		
Milk,	$3,316 01	
Butter,	859 67	
Eggs,	1,359 36	
Meat and poultry,	3,819 23	
Groceries,	2,307 92	
Fish,	463 11	
Lard,	43 48	
Vegetables,	468 00	
Fruit,	166 18	
Heat, light and pumping supplies:		$12,802 96
Coal,	2,159 49	
Electricity,	823 62	
Gasoline and oil,	249 31	
Farm and stables:		$3,232 42
Grain,	201 99	
Carriage and harness repairing,	17 55	
Horseshoeing,	14 00	
Farming tools,	59 57	
Sundries,	19 40	
Repairs and improvements:		$312 51
Lumber and hardware,	$247 87	
Glass, putty and packing, etc.,	31 69	
Miscellaneous:		$279 56
Hospital supplies and drugs,	$836 17	
Ice,	180 70	
Dry goods,	110 05	
Laundry,	2,242 50	
Freight, express and cartage,	151 81	
Sputum cups and gauze,	356 87	
Stationery and office expenses,	193 65	
Telephone,	210 00	
Periodicals,	7 00	
Sundries,	61 21	
		$4,349 96
Total expenses for maintenance, October 1, 1910—October 1, 1911,		$32,110 46

PER CAPITA.

Average number of patients during year, ...	58.6
Total expense for maintenance for 58.6 patients, . . .	$32,110 46
Average daily expense for maintenance for 58.6 patients, .	87 97
Average daily expense for maintenance for 1 patient, .	1 50
Average weekly expense for maintenance for 1 patient, .	10 50

Receipts.

Total receipts for patients' board, October 1, 1910—September 30, 1911, ...	$11,109 73

SPECIAL REPORT, OCTOBER 1, 1910—SEPTEMBER 30, 1911.

Prepared in accordance with a resolution of the National Conference of Charities and Correction adopted May 15, 1906.

	Males	Females	Totals
Number received during the year, ...	173	67	240
Number passing out of institution during year, .	154	60	214
Number at the end of fiscal year in the institution,	42	14	56
Daily average attendance (number inmates actually present during year), ...			58.6
Average number of employees and officers during the year, ...	18	13	31

EXPENDITURES.

Current expenses:		
(1) Salaries and wages, ...	$11,133 05	
(2) Subsistence, ...	12,802 96	
(3) Ordinary repairs, ...	279 56	
(4) Office, domestic and outdoor expenses, ...	7,894 89	
Total, ...		$32,110 46
Extraordinary expenses:		
(1) New buildings, etc..	$11,083 95	
(2) Permanent improvements, existing buildings and original equipment, .	6,599 13	
		$17,683 08
Grand total, ...		$49,793 54

STATISTICAL TABLES.

TABLE 1—*Admissions and Discharges.*

	Males	Females	Totals
Number of patients admitted Oct. 1, 1910—Sept. 30, 1911 (inclusive),	173	67	240
Number of patients discharged Oct. 1, 1910—Sept. 30, 1911 (inclusive),	154	60	214
Number of deaths (included in preceding item)	47	17	64
Daily average number of patients,			58.6
Number in sanatorium Oct. 1, 1910,	23	7	30
Number remaining Sept. 30, 1911,	42	14	56

TABLE 2—*Civil Condition of Patients Admitted, October* 1, 1910—*September* 30, 1911.

	Males	Females	Totals
Married,	66	35	101
Single,	94	29	123
Widowed,	12	3	15
Divorced,	1	0	1
	173	67	240

TABLE 3—*Ages of Patients, October* 1, 1910—*October* 1, 1911.

	Males	Females	Totals
1 to 3 years,	4	3	7
14 to 20 years,	21	11	32
21 to 30 years,	42	24	66
31 to 40 years,	52	20	72
41 to 50 years,	37	8	45
51 to 60 years,	16	1	17
61 to 70 years,	1	0	1
	173	67	240

TABLE 4—*Nativity and Parentage of Patients Admitted, October* 1, 1910—*September* 30, 1911.

	Males			Females			Totals		
	Patient	Father	Mother	Patient	Father	Mother	Patient	Father	Mother
United States,	104	59	60	47	19	20	151	78	80
Russia, . .	9	10	9	4	5	5	13	15	14
Ireland, .	19	51	50	7	25	27	26	76	77
Canada, .	4	5	4	0	1	2	4	6	6
Sweden,. .	8	9	9	0	1	1	8	10	10
Germany, .	7	15	15	0	2	1	7	17	16
Poland,. .	4	3	3	1	1	1	5	4	4
England, .	2	4	4	1	5	2	3	9	6
Italy, . .	7	7	7	2	2	2	9	9	9
Finland, .	1	1	1	0	0	0	1	1	1
Austria, .	5	5	6	4	5	5	9	10	11
China, .	1	1	1	0	0	0	1	1	1
Denmark, .	1	1	1	0	0	0	1	1	1
Roumania, .	1	1	1	0	0	0	1	1	1
Scotland, .	0	0	1	0	0	0	0	0	1
Norway, .	0	1	1	0	0	0	0	1	1
Switzerland,	0	0	0	1	1	1	1	1	1
	173	173	173	67	67	67	240	240	240

TABLE 5—*Residence of Patients Admitted, October* 1, 1910—*September* 30, 1911.

Place	Number	Place	Number
Bridgeport,	105	Thompsonville	1
New Haven,	19	Stafford Springs,	2
Danbury,	8	Torrington,	1
Norwalk,	9	Waterbury,	6
Stamford,	7	Hamden,	1
So. Stamford,	4	Seymour,	1
Hartford,	16	Stratford,	1
New Britain,	6	North Grosvenordale,	1
Derby,	3	Bethany,	1
Ansonia,	9	Westport,	1
Bethel,	1	Noroton,	1
Darien,	3	New Milford,	1
Shelton,	6	Southington,	1
Thomaston,	3	Newtown,	1
Stonington,	2	Lime Rock,	1
Brookfield,	1	Winnipauk,	1
Tariffville,	3	New Fairfield,	1
Vernon,	3	New Hartford,	1
Greenwich,	6		
Middletown,	2	Total,	240

TABLE 6—*Occupations*.

	Number		Number
Actor,	1	Laborer,	20
Agent,	1	Locksmith,	3
Bookkeeper,	1	Machinist,	13
Butcher,	1	Mill hand,	2
Blacksmith,	1	Motorman,	2
Barber,	1	Meat cutter,	2
Brass worker,	1	Moulder,	5
Brickmaker,	1	Moving-picture man,	1
Brass polisher,	5	Needle maker,	1
Cutlery worker,	2	Oysterman,	3
Chauffeur,	5	Painter,	1
Core maker,	1	Plumber,	1
Clerk,	10	Peddler,	1
Carpenter,	1	Press-brass worker,	1
Conductor,	1	Piano maker,	1
Cigar maker,	1	Paper hanger,	1
Cabman,	1	Paper maker,	1
Coach painter,	1	Rubber worker,	1
Casting cleaner,	1	Saloonkeeper,	2
Candy packer,	1	School,	14
Contractor,	1	Stage hand,	1
Dressmaker,	2	Shipping clerk,	2
Draughtsman,	2	Shoemaker,	1
Die sinker,	1	Shearmaker,	1
Electrician,	1	Steam-valve assy.,	1
Edge trimmer,	1	Storekeeper,	1
Engineer (stationary)	1	Sailor,	2
Factory hand,	22	Silica grinder,	1
Fireman (stationary),	2	Steam fitter,	1
Forger,	1	School teacher,	1
Florist,	1	Tailoress,	1
Farmer,	3	Toolmaker,	1
Foreman (laborers),	1	Tumbling room,	1
Fisherman,	1	Teamster,	4
Gardener,	1	Unknown,	7
Housework,	29	Weaver,	4
Hat trimmer,	1	Waitress,	1
Hatter,	6	Wire pickler,	1
Hotel clerk,	1	Wood turner,	1
Ice-wagon driver,	1	Waiter,	2
Jockey,	1	Wood carver,	1
Jeweler,	1	Wood finisher,	1
Laundryman,	1	Yardmaster, R. R.,	1
Laundress,	3		

TABLE 7—*Condition on Admission, October* 1, 1910—*September* 30, 1911.

	Males	Females	Totals
Incipient,	26	2	28
Moderately advanced,	57	36	93
Far advanced,	83	29	112
Acute miliary,	1	0	1
Surgical,	2	0	2
Non-tuberculous,	2	0	2
Not treated,	2	0	2
Totals,	173	67	240

TABLE 8—*Condition of Discharges, October* 1, 1910—*September* 30, 1911.

	Males	Females	Totals
Disease arrested,	17	3	20
Improved,	49	19	68
Unimproved,	37	21	58
Non-tuberculous,	2	0	2
Not treated,	2	0	2
Died,	47	17	64
Totals,	154	60	214

TABLE 9—*Deaths, October* 1, 1910—*September* 30, 1911.

	Duration of Disease			Sanatorium Residence		
	Males	Females	Totals	Males	Females	Totals
Under 1 month,	10	0	10	17	6	23
1 to 3 months,	10	5	15	18	8	26
3 to 6 months,	10	5	15	5	2	7
6 to 9 months,	5	3	8	4	1	5
9 months to 1 year,	6	1	7	3	0	3
1 to 2 years,	4	2	6	0	0	0
2 to 5 years,	2	1	3	0	0	0
5 to 10 years,	0	0	0	0	0	0
Totals,	47	17	64	47	17	64

Maintenance account Fairfield County Home from October 1, 1911—October 1, 1912.

Analysis of Expenses.

Average number of patients per day,		71.6
Salaries and payroll,		$13,225 67
Food:		
Milk,	$3,995 33	
Butter,	1,215 57	
Eggs,	1,692 69	
Meat and poultry,	5,826 91	
Groceries,	4,464 93	
Fish,	594 89	
Lard,	58 95	
Vegetables,	1,249 58	
Fruit,	169 17	
		$19,268 02
Heat, light and pumping station:		
Coal,	$2,744 36	
Electricity,	1,245 14	
Gasoline and oil,	314 73	
		$4,304 23
Farm and stables:		
Carriage and harness repairing,	64 75	
Grain,	474 60	
Horseshoeing,	42 90	
		$582 25
Repairs and improvements:		
Lumber and hardware,	$282 47	
Glass, putty, etc.,	14 65	
		$297 12
Miscellaneous:		
Hospital supplies and drugs,	$1,298 31	
Ice,	190 06	
Dry goods,	220 75	
Laundry,	2,230 52	
Freight, express and cartage,	427 30	
Sputum cups, gauze, paper napkins,	705 72	
Stationery and office expenses,	589 75	
Telephone,	243 58	
Periodicals,	7 00	
Soap,	121 90	
Sundries,	3 00	
		$5,839 89
Total expenses for maintenance, October 1, 1911—October 1, 1912,		$43,517 18

PER CAPITA.

Average number of patients during the year,	71.6
Total expenses for maintenance of 71.6 patients,	$43,517 18
Average daily expense for maintenance 71.6 patients,	119 23
Average daily expense for maintenance 1 patient,	1 665
Average weekly expense for maintenance 1 patient,	11 655

RECEIPTS.

Total receipts for patients' board, October 1, 1911—September 30, 1912,	$14,860 67

SPECIAL REPORT, OCTOBER 1, 1911—SEPTEMBER 30, 1912.

Prepared in accordance with a resolution of the National Conference of Charities and Correction adopted May 15, 1906.

	Males	Females	Totals
Number received during the year,	127	75	202
Number passing out of the institution during the year,	109	53	162
Number at the end of the fiscal year in the institution,	60	36	96
Daily average attendance (number of inmates actually present during year),			71.6
Average number of officers and employees during the year,	21	15	36

EXPENDITURES.

Current expenses:		
(1) Salaries and wages,	$13,225 67	
(2) Subsistence,	19,268 02	
(3) Ordinary repairs,	297 12	
(4) Office, domestic and outdoor expenses,	10,726 37	
Total,		$43,517 18
Extraordinary expenses:		
(1) New buildings, etc.,	$16,791 19	
(2) Permanent improvements to existing buildings, including new equipment,	6,246 16	
Total,		$23,037 35
Grand total,		$66,554 53

STATISTICAL TABLES.

TABLE 1—*Admissions and Discharges.*

	Males	Females	Totals
Number of patients admitted Oct. 1, 1911—Sept. 30, 1912 (inclusive),	127	75	202
Number of patients discharged Oct. 1, 1911—Sept. 30, 1912 (inclusive),	109	53	162
Number of deaths (included in preceding item),	52	31	83
Daily average number of patients,			71.6
Number in Sanatorium Oct. 1, 1911,	42	14	56
Number remaining Sept. 30, 1912,	60	36	96

TABLE 2—*Civil Condition of Patients Admitted, October* 1, 1911—*September* 30, 1912.

	Males	Females	Totals
Married,	42	41	83
Single,	77	31	108
Widowed,	8	3	11
Divorced,	0	0	0
Total,	127	75	202

TABLE 3—*Ages of Patients, October* 1, 1911—*September* 30, 1912.

	Males	Females	Totals
1 to 13 years,	1	3	4
14 to 20 years,	19	13	32
21 to 30 years,	35	26	61
31 to 40 years,	37	23	60
41 to 50 years,	21	9	30
51 to 60 years,	9	1	10
61 to 70 years,	5	0	5
Total,	127	75	202

TABLE 4—*Nativity and Parentage of Patients Admitted, October* 1, 1911—*September* 30, 1912.

	Males			Females			Totals		
	Patient	Father	Mother	Patient	Father	Mother	Patient	Father	Mother
United States,	62	27	28	36	23	25	98	50	53
Russia, . .	11	12	12	3	3	4	14	15	16
Ireland, .	16	39	40	11	18	17	27	57	57
Canada, .	0	3	1	2	1	2	2	4	3
Sweden,. .	8	10	10	2	3	3	10	13	13
Germany, .	4	8	8	2	5	3	6	13	11
Poland, .	0	0	0	1	2	2	1	2	2
England, .	2	4	3	2	4	3	4	8	6
Italy, . .	9	10	10	6	6	6	15	16	16
Finland, .	0	0	0	0	0	0	0	0	0
Austria,. .	10	10	10	8	7	7	18	17	17
Denmark, .	0	0	0	0	0	0	0	0	0
Roumania, .	0	0	0	0	0	0	0	0	0
Scotland, .	1	0	1	0	0	0	1	0	1
Bulgaria, .	1	1	1	0	0	0	1	1	1
Syria, . .	1	1	1	0	1	1	1	2	2
Norway, .	1	1	1	0	0	0	1	1	1
Turkey, .	1	1	1	0	0	0	1	1	1
Bermuda, .	0	0	0	1	1	1	1	1	1
France, . .	0	0	0	1	1	1	1	1	1
* Total,	127	127	127	75	75	75	202	202	202

TABLE 5—*Residence of Patients Admitted, October* 1, 1911—*September* 30, 1912.

Place	Number	Place	Number
Bridgeport,	77	Fall Village,	2
New Haven,	32	Shelton,	2
Norwalk,	7	Ridgefield,	1
So. Norwalk,	5	Hamden,	1
Stamford,	13	Winchester,	1
Derby,	7	Lakeville,	1
Naugatuck,	1	Norwich,	1
Greenwich,	3	Botsford,	1
Stratford,	3	Hartford,	1
Guilford,	1	West Haven,	1
Easton,	1	Warren,	1
Westport,	1	Sharon,	1
Ansonia,	9	Essex,	1
Allingtown,	1	New York,	1
New London,	5	East Haven,	1
Versailles,	1	Oxford,	1
Mystic,	2	Bethel,	1
Waterbury,	2	Middletown,	1
Brookfield,	1	Griswold,	1
Danbury,	9	Total,	202

TABLE 6—*Occupations.*

	Number		Number
Bartender,	5	Locksmith,	1
Barber,	3	Maid,	3
Brass polisher,	2	Moulder,	6
Blacksmith's helper,	1	Machinist,	8
Bridge worker,	1	Mason,	1
Box maker,	4	Night watchman,	1
Brass worker,	1	Office boy,	2
Brick maker,	1	Picture framer,	1
Blacksmith,	2	Painter,	4
Conductor,	2	Powder carrier,	1
Carpenter,	4	Peddler,	1
Cable tester,	1	Policeman,	1
Car cleaner,	1	Photographer,	1
Corset packer,	1	Plumber,	1
Carriage-spring roller,	1	Restaurant proprietor,	1
Collector,	1	Rubber worker,	1
Clerk,	7	Sailor,	1
Child,	1	Sawyer,	1
Cement worker,	1	Shoemaker,	1
Drop forger,	1	School,	7
Druggist,	1	Stone crusher,	1
Draughtsman,	2	Shipper,	2
Foreman,	1	Saloonkeeper,	1
Fireman,	2	Silver plater,	3
Farmer,	1	Silver polisher,	1
Factory hand,	21	Seamstress,	1
Grocery clerk,	1	Tumbling room,	1
Gardener,	2	Toolmaker,	2
Hatter,	6	Tailor,	1
Housework,	40	Textile worker,	2
Hat trimmer,	1	Teamster,	1
Huxter,	1	Typemoulder,	1
Ivory worker,	1	Unknown,	3
Ice-wagon driver,	1	Watch inspector,	1
Laborer,	9	Wood chopper,	1
Laundress,	2	Wireless operator,	1

TABLE 7—*Condition on Admission, October* 1, 1911—*September* 30, 1912.

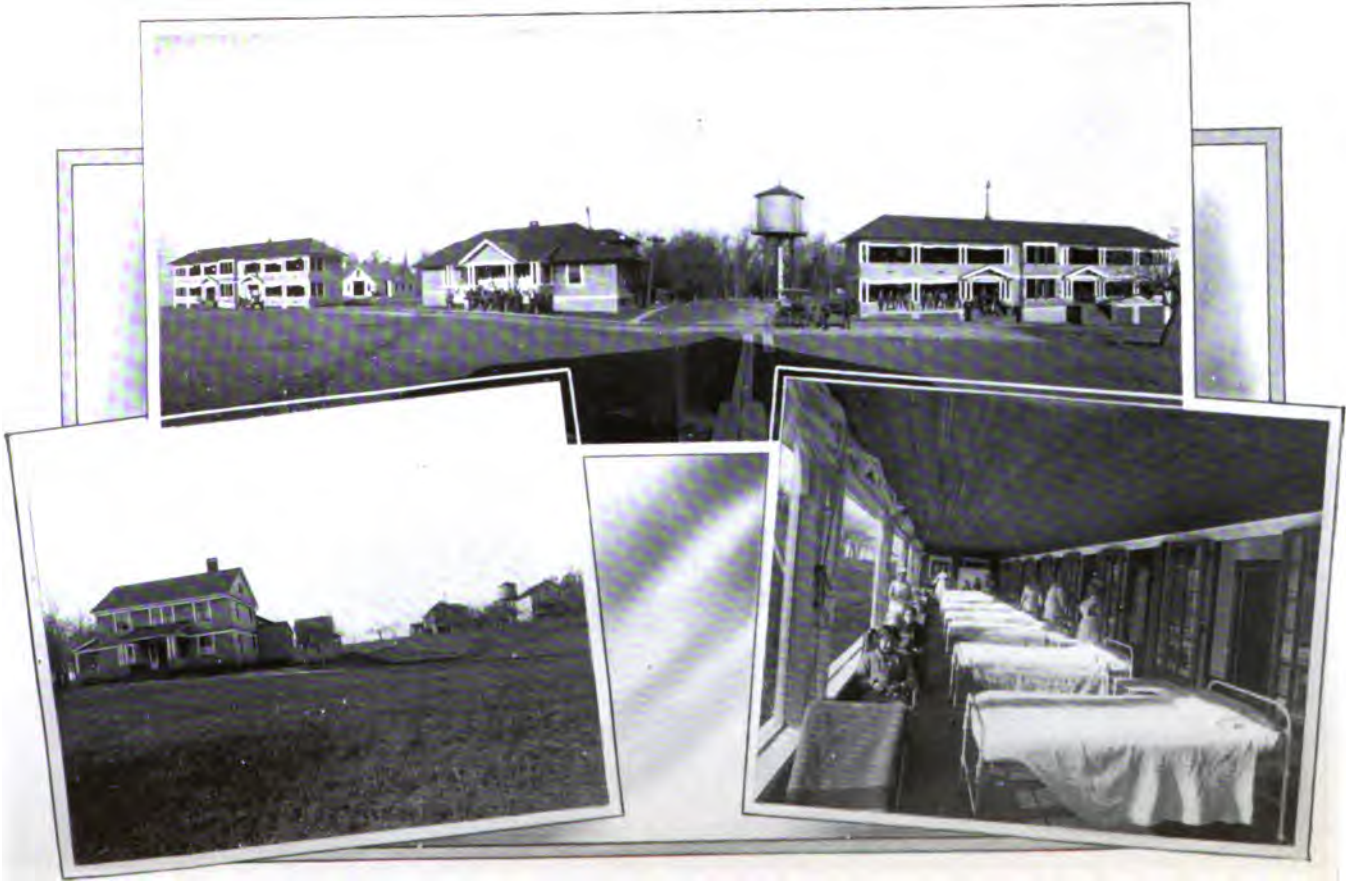
	Males	Females	Totals
Incipient,	10	8	18
Moderately advanced,	41	29	70
Far advanced,	71	36	107
Acute miliary,	1	0	1
Surgical,	2	2	4
Non-tuberculous,	0	0	0
Not treated,	2	0	2
	127	75	202

TABLE 8—*Conditions of Discharges, October* 1, 1911—*September* 30, 1912.

	Males	Females	Totals
Disease arrested,	8	4	12
Improved,	22	12	34
Unimproved,	25	6	31
Non-tuberculous,	0	0	0
Not treated,	2	0	2
Died,	52	31	83
	109	53	162

TABLE 9—*Deaths, October* 1, 1911—*September* 30, 1912.

	Duration of Disease			Sanatorium Residence		
	Males	Females	Totals	Males	Females	Totals
Under 1 month,	4	1	5	17	7	24
1 to 3 months,	5	5	10	16	14	30
3 to 6 months,	13	4	17	11	4	15
6 to 9 months,	14	7	21	5	2	7
9 months to 1 year,	2	6	8	2	1	3
1 to 2 years,	3	3	6	1	3	4
2 to 5 years,	7	3	10	0	0	0
5 to 10 years,	4	2	6	0	0	0
	52	31	83	52	31	83



HARTFORD SANATORIUM.
At Top   Shacks and Dining Hall.
Lower Left   Administration Building.   Lower Right   Veranda of Infirmary.

REPORT OF HARTFORD SANATORIUM.

DR. H. S. WAGNER,	*Superintendent*
DR. JOSEPH E. STROBEL,	*Assistant Superintendent*
MISS VIRA SHANK,	*Head Nurse*
DANIEL J. CARROLL,	*Secretary*
MRS. MARY MANN,	*Housekeeper*
JOHN GUINAN,	*Chief Engineer*

Financial and Medical Report of the Hartford Sanatorium

FOR THE YEARS OCTOBER 1, 1910 TO OCTOBER 1, 1911 AND FROM OCTOBER 1, 1911 TO OCTOBER 1, 1912.

DR. H. S. WAGNER, *Superintendent.*

REPORT YEAR ENDING SEPTEMBER 30, 1911.

MAINTENANCE ACCOUNT.

Analysis of Expenses.

Payroll,	$9,382 18	
		$9,382 18
Heat, Light and Power:		
Coal,	1,005 75	
Electric current,	438 44	
Gasoline and oil,	42 70	
		$1,486 89
Barn:		
Shoeing and blacksmith,	$26 90	
Wagon repair,	48 30	
Grain, hay, feed,	144 76	
Rent of wagon,	31 50	
Rent of carriage,	40 00	
Sundry,	10 80	
		$302 26
Shoes and clothing,		$68 15
Insurance,		390 97
Employment agency (securing help)		26 50
Cleaning septic tank,		42 00
Total,		$11,698 95
Freight and cartage,		$124 81
Paper goods (napkins, towels, toilet paper, etc.),		71 00
Hardware,		82 00
Labor on incinerator,		245 18
Drawing water,		74 60
Liquid soap,		78 40
Ambulance hire,		5 00
Lumber,		166 28
Ice,		183 42
Laundry,		1,424 35
Telephone,		293 24
Sundry,		139 53
Drugs, (Included in above item are gauze, bandages, surgical supplies, etc.)		1,140 39
Dry goods, towels, table linen, etc.,		939 27
Ordinary repairs,		28 84
Total,		$4,996 31

Food (meat, fish, poultry, groceries, potatoes, sugar, flour, etc.),	$7,660 04
Office expense (including books, stationery and all other incidental expenses not otherwise specified, paid directly from this office),	749 93
Total,	8,409 97
Maintenance account, Sheet No. 1,	11,698 95
Maintenance account, Sheet No. 2,	4,996 31
Total,	$25,105 23

EQUIPMENT ACCOUNT.

Analysis of Expenses.

Bedding (mattress, pillows, sheets, spreads, etc.),	$811 10
Scale,	29 00
Steam boiler and labor,	100 00
Sterilizer,	78 40
Piano,	276 00
Microscope,	110 79
Business wagon,	80 00
Rugs,	88 50
Tract of land,	25 00
Curtains,	303 80
Screens,	670 33
Brick range,	175 00
Labor and fitting range,	54 71
Total,	$2,802 63

CONSTRUCTION ACCOUNT.

Analysis of Expenses.

Well work,	$7,662 91
Pump station,	1,097 45
Balance on buildings,	1,300 00
Electrical supplies and work,	1,132 55
Setting poles and labor,	30 44
Heating contract,	309 86
Boiler foundation,	28 95
Excavating for boiler,	22 10
Covering boiler and pipes,	40 00
Water tower,	1,321 00
Sewer and work,	445 05
Mason work and supplies,	416 21
Grading,	193 95
Total,	$14,001 47

TOTAL OF ALL BILLS PAID BY TUBERCULOSIS COMMISSIONERS.

Maintenance account,	$25,105 23
Equipment account,	2,802 63
Construction account,	14,001 47
Total,	$41,909 33
Average number of patients from September 30, 1910 to September 30, 1911,	30

30)$25,105.23($836.84—Yearly cost per patient.
365)$836.84($2.29—Daily cost per patient.
$2.29 x 7 = $16.03—Weekly cost per patient.

Population, October 1, 1910 to October 1, 1911.

	Males	Females	Totals
Number received for the year,	79	75	154
Number at the end of the year,	17	17	34
Daily average attendance,	16	14	30
Average number of employees and officers,	14	11	25

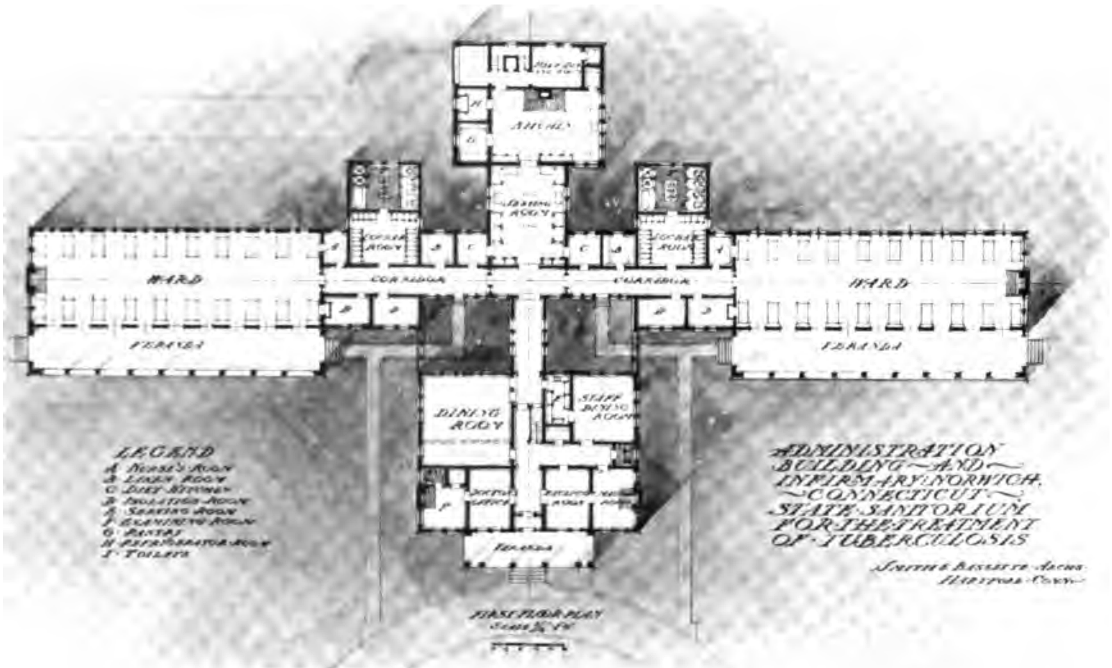
	Males	Females	Totals
Number of patients admitted Oct., 1911, to Oct., 1912,	79	75	154
Number of patients discharged,	62	58	120
Number of deaths included in above item,	19	16	35
Daily average number of patients,	16	14	30
Number in the sanatorium Oct. 1, 1910,	0	0	0
Number remaining Sept. 30, 1911,	17	17	34

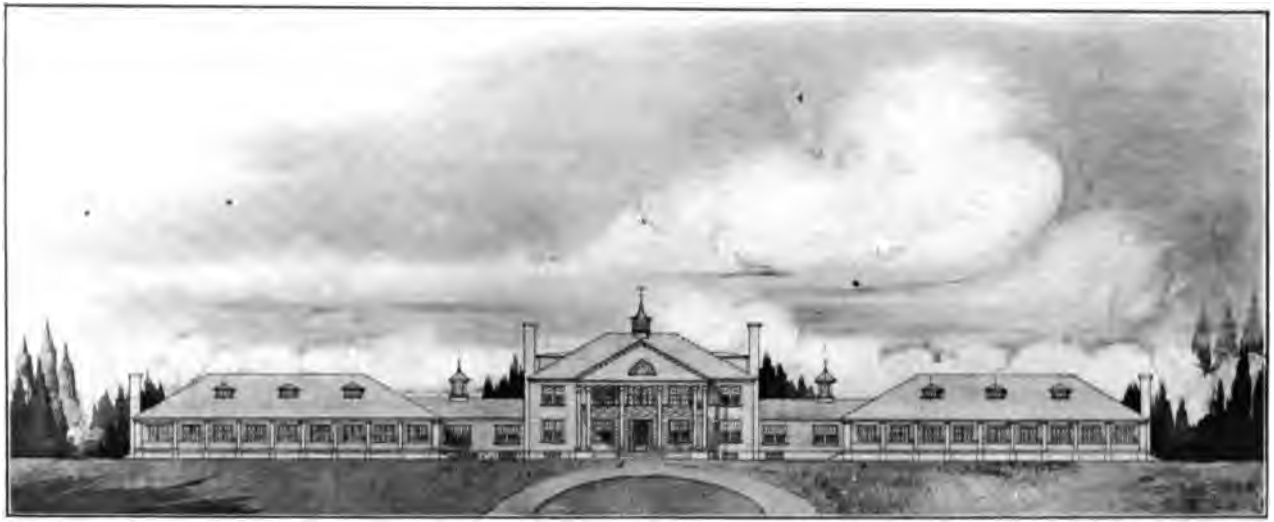
Social Condition of Patients Admitted.

	Males	Females	Totals
Married,	28	48	76
Unmarried,	39	23	62
Widowed,	1	3	4
Divorced,	0	0	0
Separated,	2	1	3
Total,	79	75	154
No records,	9	0	9

Ages of Patients Admitted.

	Males	Females	Totals
1 to 13 years,	2	1	3
14 to 20 years,	4	8	12
21 to 30 years,	13	25	38
31 to 40 years,	21	17	38
41 to 50 years,	17	6	23
51 to 60 years,	5	9	14
61 to 70 years,	4	3	7
Unknown,	13	6	19
Total,	79	75	154


ADMINISTRATION
BUILDING AND
INFIRMARY: NORWICH.
CONNECTICUT
STATE SANITORIUM
FOR THE TREATMENT
OF TUBERCULOSIS
Smith & Bassette Archs.
Hartford Conn.
LEGEND
A Nurse's Room
B Linen Room
C Diet Kitchen
D Isolation Room
E Serving Room
F Examining Room
G Pantry
H Refrigerator Room
I Toilets
WARD
VERANDA
CORRIDOR
WARD
VERANDA
CORRIDOR
LOCKER ROOM
LOCKER ROOM
DINING ROOM
KITCHEN
DINING ROOM
STAFF DINING ROOM
VERANDA
FIRST FLOOR PLAN
Scale 1/16" 1'0"



NORWICH SANATORIUM.
Administration Building and Infirmary.

Nativity and Parentage of Patients Admitted.

	Males			Females		
	Patient	Father	Mother	Patient	Father	Mother
Conn.,	25	7	5	29	8	9
N. E. States,	2	2	2	1	3	3
Other states	2	1	1	3	2	2
Total native,	29	10	8	30	11	12
Ireland,	14	30	30	6	18	18
Scotland,	0	0	0	1	2	1
Canada,	1	1	1	2	2	2
Germany,	1	3	3	6	8	8
France,	0	0	0	0	0	1
Russia,	8	9	9	7	7	7
Italy,	1	1	1	4	4	4
Sweden,	7	9	9	5	6	6
England,	1	2	3	0	3	2
Hungary,	1	1	1	0	0	0
Austria,	1	1	1	0	0	0
Holland,	0	0	0	1	1	1
Total foreign,	35	57	58	32	51	50
Total native,	29	10	8	30	11	12
Unknown,	15	12	13	13	13	13
Grand total,	79	79	79	75	75	75

Residence of Patients.

	Males	Females	Total
Hartford,	48	44	92
New Britain,	11	13	24
Cromwell,	0	1	1
Hasardville,	1	1	2
Berlin,	1	0	1
South Manchester,	7	2	9
Plainville,	0	1	1
Elmwood,	0	1	1
Winsted,	1	0	1
Wethersfield,	1	1	2
New York,	0	1	1
Burnside,	2	1	3
Bloomfield,	1	0	1
New Bedford, (Mass.),	1	0	1
Bristol,	0	2	2
Unionville,	1	1	2
Total,	75	69	144
Unknown,	4	6	10
Grand total,	79	75	154

Occupation of Patients Admitted.

	Males	Females	Totals
Housework,	0	54	54
Machinist,	7	0	7
School children,	2	4	6
Railroad men,	2	0	2
Dressmaker,	0	2	2
Tiremaker,	1	1	2
Silk weaver,	3	2	5
Carpenter,	3	0	3
Barber,	3	0	3
Laborer,	7	0	7
Tool maker,	1	0	1
Clerk,	2	0	2
Bartender,	3	0	3
Iron worker,	2	0	2
Driver,	3	0	3
Stone cutter,	1	0	1
Tailor,	3	1	4
Metal worker,	1	0	1
Farmer,	1	0	1
Peddler,	1	0	1
Plumber,	2	0	2
Messenger,	1	0	1
Salesman,	2	0	2
Lock maker,	1	0	1
Polisher,	1	0	1
Factory worker,	2	0	2
Unknown,	24	11	35
Total,	79	75	154

Condition on Admission.

	Males	Females	Totals
Incipient, ...	5	7	12
Moderately advanced, ...	19	13	32
Advanced, ...	43	44	87
Hip disease, ...	1	0	1
Non-tuberculous, ...	0	2	2
No record,.	11	9	20
Totals, ...	79	75	154

Condition of Patients on Discharge.

	Males	Females	Totals
Disease arrested, ...	2	2	4
Improved, ...	15	17	32
Not improved	16	18	34
Died, ...	19	16	35
Non-tuberculous, ...	0	2	2
Not treated (here less than one week), ...	4	1	5
Remaining, ...	17	17	34
No record, ...	6	2	8
Totals, ...	79	75	154

Deaths.

	Duration of Disease on Adm.			Sanatorium Residence		
	Males	Females	Totals	Males	Females	Totals
Less than 1 month, . . .	0	0	0	7	4	11
1 to 3 months	1	0	1	4	4	8
3 to 6 months, ...	5	1	6	4	5	9
6 to 9 months, ...	0	3	3	2	3	5
9 months to 1 year, . . .	2	6	8	1	0	1
1 to 2 years, ...	3	2	5	0	0	0
2 to 5 years, ...	3	3	6	0	0	0
5 to 10 years, ...	1	0	1	0	0	0
No record, ...	4	1	5	1	0	1
Totals, ...	19	16	35	19	16	35

HARTFORD SANATORIUM

REPORT FOR YEAR ENDING SEPTEMBER 30, 1912.

CASH ACCOUNT.

From individual patients, ...	$2,402 90	
From towns and cities, ...	10,738 17	
From societies, ...	3,804 70	
		$16,945 77
From Tuberculosis Commissioners, ...		13,853 68
From other sources, ...		100 74
Total of cash from all sources, ...		$30,900 19

CASH RESOURCES SEPTEMBER 30, 1912.

Cash on hand, ...	$579 33
Cash in bank, ...	6,244 59
Bills due from towns and cities, ...	1,582 75
Bills due from individuals, ...	439 91
Bills due from societies, ...	569 60
Bill due for State case, ...	12 57
Due for clothing given patients, ...	26 87
Total resources, ...	$9,455 62

Also cash value of inventory report.

MAINTENANCE ACCOUNT.

Analysis of Expenses.

Payroll and salary, ...		$15,610 26
Heat, light and power:		
Lamps, ...	$227 00	
Coal, ...	2,530 34	
Electric current, ...	774 40	
Gasolene and oil, ...	130 70	
		$3,662 44
Amount carried forward, ...		$19.272 70

Amount brought forward,		$19,272 70
Barn:		
Carriage repair,	$8 80	
Wagon hire,	16 00	
Blacksmith and horseshoeing,	103 46	
Horses,	415 00	
Harness,	146 75	
Grain, hay, feed,	586 29	
Sundry,	2 00	
		$1,278 30
Food:		
Meat,	$6,634 18	
Poultry,	1,728 72	
Fish,	627 88	
Groceries (canned goods, etc.),	3,931 72	
Potatoes,	732 18	
Vegetables,	209 17	
Lard,	117 56	
Butter,	2,009 18	
Eggs,	3,218 71	
Coffee,	208 50	
Milk,	5,008 47	
Flour,	208 18	
Sugar,	427 38	
Sundry,	495 04	
		$25,556 87
(Sundry account includes everything not otherwise stated, such as fruits, salt, relishes, etc.)		
Total,		$46,107 87
Kitchen supplies (pots, pans, scrub-brushes mops, etc.),	400 76	
Bedding (beds, mattress, pillows, sheets, spreads, etc.,	590 98	
Paper goods (napkins, towels, toilet paper, cups, etc.),	964 55	
Green soap (liquid)	234 00	
Fur coats (patients),	535 60	
Rubber goods (sheets, caps, bottles, etc.),	191 80	
Hardware,	264 31	
Sweeping compound (Kno Dust)	135 00	
Employment agency (securing help),	20 00	
Lumber,	72 78	
Ice,	366 96	
Ambulance hire,	10 00	
Phonograph,	34 00	
Amounts carried forward,	$3,830 74	$46,107 87

Amounts brought forward,	$3,830 74	$46,107 87
Funeral expense,	15 00	
Scales,	20 31	
Outside hospital care,	11 00	
Dry goods (towels, table linen, etc.),	728 51	
Furniture,	844 72	
Total,		$5,440 28
Drugs,	$1,941 21	
Hospital supplies (bandages, gauze, hypo. needles and syringes, thermometers, etc.),	407 95	
Plumbing repairs,	612 72	
Electric supplies,	17 10	
Auto hire (including repairs on Dr. Dinnan's car),	723 87	
Insurance,	151 75	
Tools (for making road),	145 15	
Telephone,	557 47	
Laundry,	2,745 89	
Dishes (including knives, forks, spoons, etc.),	322 89	
Clothing (for patients, orderly and doctors' suits),	275 18	
Freight and cartage,	353 54	
Ordinary repairs,	64 56	
Supt's salary and auto expense,	700 00	
Total,		$9,019 28
Office (including books, files, stationery, stamps, and all expense paid directly from this office),	794 89	
Sundry account,	157 07	
Total.		$951 96
Total maintenance account,		$61,519 39

CONSTRUCTION ACCOUNT,

Including New Buildings and Improvements on Buildings and Grounds.

Analysis of Expenses.

Nurses' home,	$8,750 00
Barn,	1,005 00
Board walk and plumbing,	405 11
Extras on buildings,	914 27
Ice box,	925 00
Sewer,	2,738 48
Pumping water,	166 00
Cartage,	140 80
Labor and material,	404 86
Pump house,	252 50
Blasting rock,	75 00
Coal box,	225 00
Water heater,	76 10
Electric wiring,	50 15
Advertising,	14 35
Total construction work,	$16,142 62

EQUIPMENT ACCOUNT.

Analysis of Expenses.

Bedding (mattress, pillows, sheets, spreads, etc.),	$1,822 48
Clothing (pajamas, bath robes, etc.),	177 74
Water main,	8,000 00
Potato peeler,	45 00
Galvanized oven,	85 00
Ice-water tank,	39 00
Safe,	90 00
Pump,	178 00
Wagons,	247 50
Surgical supplies,	104 70
Pool table,	60 00
Fire extinguishers,	90 00
Incinerator and repairs,	476 40
Sundry account,	13 85
Total equipment account,	$11,429 67

TOTAL OF BILLS PAID BY TUBERCULOSIS COMMISSIONERS.

Maintenance account,	$61,519 39
Construction account,	16,142 62
Equipment account,	11,429 67
	$89,091 68
Amount sent Geo. I Allen by this office,	$10,025 00
Average number of patients from September 30, 1911 to September 30, 1912,	93 daily

93)$61,519.39($661.50—Yearly cost per patient.
366)$661.50($1.81—Daily cost per patient.
$1.81 x 7 = $12.67—Weekly cost per patient.

Population October 1, 1911 *to September* 30, 1912.

	Males	Females	Totals
Number received during the year,	197	103	300
Number passing out during the year,	126	73	199
Number in the institution at end of year,	75	33	108
Daily average attendance (number of inmates actually present) during the year,	61	32	93
Average number of employees and officers during the year (month),	29	20	49

	Males	Females	Totals
Number of patients admitted Oct., 1911 to Sept. 30, 1912 (inclusive),	197	103	300
Number of patients discharged Oct. 1, 1911 to Sept. 30, 1912 (inclusive),	126	73	199
Number of deaths included in preceding item,	47	23	70
Daily average number of patients,	61	32	93
Number in sanatorium Oct. 1, 1911,	17	16	33
Number remaining Sept. 30, 1912,	75	33	108

Social Condition of Patients Admitted.

	Males	Females	Totals
Married,	54	51	105
Single,	121	47	168
Widowed,	17	4	21
Divorced,	2	0	2
Separated,	3	1	4
Totals,	197	103	300

Ages of Patients Admitted.

	Males	Females	Totals
1 to 13 years,	8	5	13
14 to 20 years,	29	24	53
21 to 30 years,	60	40	100
31 to 40 years,	42	31	73
41 to 50 years,	38	2	40
51 to 60 years,	17	0	17
61 to 70 years,	3	1	4
Totals,	197	103	300

Nativity and Parentage of Patients Admitted.

	Males			Females			Totals		
	Patient	Father	Mother	Patient	Father	Mother	Patient	Father	Mother
Connecticut,	72	40	17	51	10	11	123	50	28
N. E. States,	6	3	1	4	4	5	10	7	6
Other states,	10	19	12	2	5	4	12	24	16
Total native,	88	62	30	57	19	20	145	81	50
Ireland, . .	43	54	89	18	42	41	61	96	130
Italy, . .	10	10	10	4	4	4	14	14	14
Germany, .	4	9	8	1	2	2	5	11	10
Russia, .	27	27	27	9	19	19	36	46	46
England, .	3	9	9	2	2	2	5	11	11
Turkey, .	0	2	2	1	1	1	1	3	3
Austria, .	4	5	4	3	4	4	7	9	8
Sweden, .	10	10	10	3	5	5	13	15	15
Scotland, .	3	4	3	0	0	0	3	4	3
Canada, .	3	3	3	2	2	2	5	5	5
Syria, . .	1	1	1	2	2	2	3	3	3
France, . .	1	1	1	0	0	0	1	1	1
Roumania, .	0	0	0	1	1	1	1	1	1
Totals,	197	197	197	103	103	103	300	300	300

Residence of Patients on Admission.

	Males	Females	Totals		Males	Females	Totals
Hartford, . . .	102	49	151	Bradleyville, . .	1	0	1
New Britain, . .	35	29	64	Plymouth, . . .	0	1	1
Middletown, . .	6	3	9	Hopewell, . . .	1	0	1
Thompsonville, .	3	1	4	Somers, . . .	0	1	1
Waterbury, . .	0	1	1	West Suffield, . .	1	0	1
Waterford, . .	0	1	1	Norwich, . . .	0	2	2
East Windsor Hill,	2	0	2	Bridgeport,. . .	1	0	1
New London, . .	4	0	4	Buckland,. . .	1	0	1
South Manchester,	5	1	6	Willimantic, . .	1	1	2
Bristol, ...	0	1	1	West Rocky Hill,	1	1	2
Windsor, . . .	2	1	3	Terryville, . . .	1	0	1
Plainville, . . .	2	1	3	Broadbrook, . .	2	0	2
New Haven, . .	2	0	2	Enfield, . . .	0	1	1
Danielson, . . .	0	1	1	Glastonbury, . .	0	1	1
Tariffville, . . .	1	0	1	Jewett City, .	1	0	1
Union Center, . .	0	1	1	Westford, . . .	1	0	1
Hockanum, . .	1	0	1	Meriden, . . .	1	0	1
Kensington, . .	1	1	2	Simsbury, . . .	0	1	1
Haddam, . . .	4	0	4	Avon, ...	1	0	1
Southington, . .	1	0	1	Bloomfield, . .	1	0	1
Rockville, . . .	2	0	2	Collinsville, . . .	0	1	1
Newington,. . .	2	0	2	Forestville, . .	0	1	1
Lebanon, . . .	1	0	1	Deep River, . .	1	0	1
Moodus, . . .	1	0	1	Berlin, ...	3	0	3
South Coventry, .	1	0	1				
Union, ...	0	1	1	Totals, . .	197	103	300

Occupation of Patients Admitted.

	Males	Females	Totals
Timekeeper,	0	1	1
Dressmaker,	0	3	3
Housework,	0	65	65
Nurse,	0	1	1
Carpenter,	3	0	3
Clock maker,	3	0	3
Tobacco packer,	3	0	3
School child,	12	6	18
Shipping clerk,	2	0	2
Silk-ribbon weaver,	0	3	3
Broad-silk weaver,	3	4	7
Farmer,	13	0	13
Auto trimmer,	1	0	1
Paper glazier,	1	0	1
Factory worker,	3	1	4
Typewriter assembler,	4	0	4
Bricklayer and plasterer,	3	0	3
Machinist,	11	0	11
Nail maker,	0	2	2
Gas maker,	1	0	1
Laborer,	15	0	15
Tailor,	2	0	2
Rubber maker,	4	0	4
Barber,	3	0	3
Teamster,	11	0	11
Copper filer,	0	1	1
Railroad brakeman,	2	0	2
Dye-house worker,	1	0	1
Paper maker,	1	0	1
Peddler,	1	0	1
Rag-picker,	1	0	1
Bartender,	3	0	3
Spooler (silk),	0	2	2
Metal presser,	6	0	6
Plumber,	2	0	2
Roofer,	2	0	2
Gardener,	3	0	3

Occupation of Patients Admitted.

	Males	Females	Totals
Metal stamper,	3	2	5
Cotton weaver,	2	1	3
Coppersmith,	1	0	1
Draughtsman,	1	0	1
Grinder and polisher,	6	0	6
Pharmacist,	1	0	1
Wool spinner,	3	0	3
Bartender,	1	0	1
Varnisher,	2	0	2
Quilt cutter,	1	0	1
Electrician,	2	0	2
Screw maker,	6	3	9
Clerk,	1	2	3
Carpet weaver,	2	0	2
Machine driller,	1	2	3
Electro plater,	2	0	2
Waiter and waitress,	3	2	5
Harness maker,	1	0	1
Laundry man,	1	0	1
Punch-press Oper.,	2	0	2
Fireman,	2	0	2
Stone cutter,	2	0	2
Boothlack,	1	0	1
Hostler,	3	0	3
Stenographer,	0	1	1
Coachman,	2	0	2
Lather,	1	0	1
Steam fitter,	2	0	2
Student,	1	0	1
Solderer,	2	0	2
Fuse maker,	1	1	2
Sailor,	2	0	2
Brush maker,	2	0	2
Painter,	2	0	2
Compositor,	3	0	3
Loco. inspector,	1	0	1
Type aligner,	1	0	1
Iron moulder	2	0	2
Telephone operator,	2	0	2
Lock maker,	3	0	3
Totals,	197	103	300

Condition of Patients on Admission.

	Males	Females	Totals
Incipient,	22	12	34
Moderately advanced,	57	34	91
Advanced,	118	55	173
Non-tuberculous,	0	2	2
Totals,	197	103	300

Condition of Patients on Discharge.

	Males	Females	Totals
Disease arrested,	5	2	7
Improved,	37	28	65
Not improved,	25	9	34
Died,	47	23	70
Non-tuberculous,	0	2	2
Not treated (in the institution less than one week),	13	8	21
Totals,	127	72	199

Deaths.

	Duration of Disease			Sanatorium Residence		
	Males	Females	Totals	Males	Females	Totals
Under 1 month,	0	0	0	24	7	31
1 to 3 months,	7	5	12	18	11	29
3 to 6 months,	10	9	19	2	3	5
6 to 9 months,	9	1	10	2	1	3
9 months to 1 year,	3	0	3	1	1	2
1 to 2 years,	9	3	12			
2 to 5 years,	8	5	13			
5 to 10 years,	1	0	1			
Totals,	47	23	70	47	23	70

INVENTORY REPORT SEPTEMBER 30, 1912.

HARTFORD COUNTY SANATORIUM.

Construction account,	$68,364 82
Maintenance account,	4,842 70
Equipment account,	8,492 43
Present valuation of buildings and stock,	$81,709 95

CONSTRUCTION ACCOUNT.

The Construction of Buildings, Sewers, Wells, etc., and Additions to Same:

Administration building, Infirmary building,	$12,500 00
Two shacks and dining hall,	20,900 00
Barn,	1,925 00
Pump station,	3,420 00
Cottage,	4,200 00
Nurses' home,	8,750 00
Ice box,	925 00
Coal box,	225 00
Water heater,	76 10
Sewer system,	2,738 48
Artesian well and labor incidental to erecting same,	7,662 91
Water towers (32,000 gallons),	1,321 00
Sterilizer,	78 40
Boiler for above,	100 00
Heating plant,	1,110 00
Two engines and pump,	1,097 45
One brick incinerator,	245 18
One iron incinerator,	420 00
Screening wards and buildings,	670 30
Total construction work,	$68,364 82

ANALYSIS OF EQUIPMENT INVENTORY SEPTEMBER 30, 1912.

HARTFORD COUNTY SANATORIUM.

Office,	$229 35
Main dining hall,	302 50
Main kitchen,	562 90
Dining pantry,	361 24
Nurses' dining hall,	42 05
Superintendent's quarters,	206 10
Shack No. 1,	1,429 08
Shack No. 2,	941 65
Laboratory,	150 76
Nurses' home,	1,116 37
Infirmary kitchen,	208 50
Help's cottage,	469 75
Male infirmary,	1,413 16
Female infirmary,	1,059 02
Total,	$8,492 43

ANALYSIS OF MAINTENANCE INVENTORY SEPTEMBER 30, 1912.

HARTFORD COUNTY SANATORIUM.

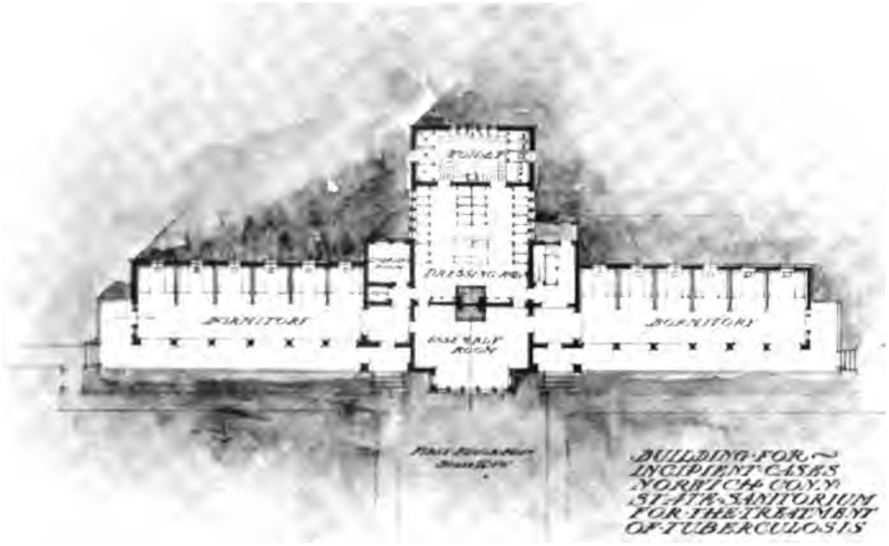
Help's cottage,	$237 69
Infirmary kitchen,	110 55
Store-room,	1,931 65
Shack No. 1,	404 89
Shack No. 2,	336 34
Barn,	1,455 03
Pump house,	41 29
Tool house,	89 42
Carpenter supplies,	16 20
Incinerator supplies,	37 12
Barber supplies,	9 55
Superintendent's quarters,	21 63
Nurses' dining hall,	50 24
Help's dining hall,	75 00
Staff table,	26 10
Total,	$4,842 70

VALUATION.

Land,	$8,000 00
Administration building,	8,500 00
Farmhouse,	4,990 00
Toolhouse,	600 00
Barn,	1,100 00
Female shack, Male shack, Dining hall,	22,435 00
Refrigerator,	900 00
Nurses' home,	4,000 00
Superintendent's cottage,	5,282 00
Female incipient shack,	8,890 00
Morgue,	1,198 00
Pumping stations,	6,400 00
Incinerator,	450 00
	$72,745 00

EQUIPMENT.

Including furniture, beds and bedding, linens, household and hospital supplies, farming utensils, horses, carriages, wagons and harnesses,	$20,553 00
Total valuation,	$93,298 00

DORMITORY
TOILET
DRESSING RM.
DORMITORY
BUILDING·FOR~
INCIPIENT·CASES
NORWICH·CONN.
STATE·SANITORIUM
FOR·THE·TREATMENT
OF·TUBERCULOSIS

NORWICH SANATORIUM.
Shack for Incipient Cases.

Norwich Sanatorium

Dr. Hugh B. Campbell, *Superintendent.*

Valuation of Norwich Sanatorium, September 30, 1912.

Land,	$9,500 00	
Construction,	51,255 08	
		$60,755 08

Report of Secretary

(Geo. I. Allen)

BEGINNING OCTOBER 1, 1910 AND ENDING SEPTEMBER 30, 1911.

Financial Statement.

Expenditures.

	Meriden	Hartford	Shelton	Total
Construction,	$7,929 75	$14,468 55	$8,583 95	$30,982 25
*Equipment,	740 15	1,242 16	992 75	2,975 06
	$8,669 90	$15,710 71	$9,576 70	$33,957 31

	Salaries	Expenses	Total	
Dr. G. H. Knight,	$2,500 00	$424 61	$2,924 61	
John F. Gunshanan,	2,500 00	272 00	2,772 00	
Geo. H. Hall,.	1,875 00	358 78	2,233 78	
Dr. S. J. Maher,	625 00	13 00	638 00	
Geo. I. Allen (Sec'y),	1,500 00		1,500 00	
	$9,000 00	$1,068 39		$10,068 39
				$44,025 70

Maintenance.

Meriden	Hartford	Shelton	Total
$57,193 95	$28,121 41	$40,179 35	$125,494 71

Amount received for board of patients,		$31,023 15

Recapitulation.

Total amount expended by Board, construction, etc.,	$44,025 70	
Total amount expended by Board, maintenance,	125,494 71	
		$169,530 41
Cash on hand,		$6,119 84

Financial Statement.

BEGINNING OCTOBER 1, 1911 AND ENDING SEPTEMBER 30, 1912.

Expenditures.

	Meriden	Hartford	Shelton	Norwich	Totals
Cons.,	$39,139 39	$22,252 57	$14,291 19	$60,755 08	$136,428 23
Equip.,	1,466 95	2,428 19	1,443 41		5,338 55
	$40,606 34	$24,680 76	$15,734 60	$60,755 08	$141,766 78

	Salaries	Expenses	Total	
Dr. G. H. Knight,	$2,500 00	$496 17	$2,996 17	
J. F. Gunshanan,	2,500 00	581 67	3,081 67	
Dr. S. J. Maher,	2,500 00	416 23	2,916 23	
Geo. I. Allen (Sec'y),	1,500 00		1,500 00	
	$9,000 00	$1,494 07	$10,494 07	$10.494 07
				$152.260 85

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*Land account not carried separately after October 1, 1910.

MAINTENANCE.

Meriden	Hartford	Shelton	Total
$77,783 43	$67,297 72	$53,959 56	$199,040 71

Amount received for board of patients, ...	$55,083 80

RECAPITULATION.

Total amount expended by Board, construction, etc., . . .	$152,260 85
Total amount expended by Board, maintenance, ...	199,040 71
	$351,301 56
Cash on hand, ...	$42,157 57

DR. GEORGE H. KNIGHT, OF LAKEVILLE.
Chairman of The Tuberculosis Commission.
Born November 24, 1855—Died October 4, 1912.

[*Extract from the Minutes of the Meeting of the Tuberculosis Commission, October* 14, 1912.]

"WHEREAS, our beloved Chairman, Dr. George H. Knight, died suddenly and unexpectedly on October 4, 1912, while addressing a meeting of his fellow townsmen of Lakeville, gathered to show their approval of his recent nomination for Congress, and,

"WHEREAS, we his fellow members of the State Tuberculosis Commission desire to participate officially in the State's mourning at the departure from earth of this faithful servant, wise physician and kindly man, we hereby

"RESOLVE, that in the death of Dr. Knight, Connecticut has lost a most worthy son; the poor and the tuberculous and the feeble-of-mind have lost a great-hearted patron; and we have lost a counsellor and friend whose like we may not know again; and we further

"RESOLVE, that this feeble expression of our sorrow be entered on the minutes of our meeting today, and that a copy of these minutes be sent to the bereaved wife and daughter, for whose welfare and happiness he constantly worked and prayed."

(Signed) JOHN F. GUNSHANAN,
STEPHEN J. MAHER, M. D.,
GEORGE I. ALLEN, Secretary.

State of Connecticut

PUBLIC DOCUMENT No. 55

SECOND REPORT

OF

CONNECTICUT COLONY FOR EPILEPTICS

MANSFIELD, CONN.

TO

THE GOVERNOR

For the Two Fiscal Years Ended September 30, 1912.

PRINTED IN COMPLIANCE WITH STATUTE

HARTFORD
Published by the State
1912

Publication
Approved by
The Board of Control

JOURNAL PUBLISHING CO.,
ROCKVILLE, CONN.

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Vice President

JOHN H. MOUNTAIN, M. D.

Treasurer

WILLIAM P. KELLEY

Secretary

WILLIAM L. HIGGINS, M. D.

Superintendent

DONALD L. ROSS, M. D.

Farmer

ROLLIN L. BIRDSALL

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CARL FOSTER	Bridgeport
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JOHN H. MOUNTAIN, M. D.	Middletown
WILLIAM P. KELLEY	Killingly

The Colony is located half a mile from Mansfield Depot on the Central Vermont Railroad, 9 miles north of Willimantic and 11 miles south of Stafford Springs. It is 20 miles east of Hartford.

The Colony can be reached by the Central Vermont Railroad via either Willimantic, or Stafford Springs. There are four passenger trains each way daily.

It is hoped that the buildings being erected will be ready for occupancy early in the summer of 1913. General notice will be given when the Colony is ready to receive patients.

Address all communications, relative to admission of patients, etc., to the Superintendent, Dr. Donald L. Ross, Mansfield Depot, Conn.

Trustees' Report.

To the Honorable Senate and House of Representatives of the
State of Connecticut:

We have the honor to present herewith the second report of the Board of Trustees of the Connecticut Colony for Epileptics, for the period ending September 30th, 1912.

MEMBERSHIP.

The personnel of the Board remains the same as constituted at the date of the last report, the Governor of the state having reappointed the trustees whose tenure of office expired in September, 1910, and in September, 1911.

PROGRESS.

The legislature of 1911 voted appropriations for structures intended for the housing and care of eighty patients and for other structures appertaining thereto, as appears in the Superintendent's report to which you are referred for further detail and comment.

We feel that this work has thus far been carried on carefully and conscientiously; while we would have been pleased to have had the institution already in running order at this time, we have met with so many problems to solve that we are rather happy to be able to state that we have progressed so well thus far. As a matter of fact we have really been at work upon our plans and construction but little over a year owing to the fact that our appropriation was voted at the very close of the session and was not available until October 1911, and hence the added reason for delay.

Since our organization it was found desirable to add to our holdings an adjoining farm, known as the Green farm, which, possessing many qualities extremely helpful to our future work, lay upon the route over which our spur track has been most advantageously located; it also embraced the direct line between our central sewage system and the river; and finally it contained abundant sand and gravel beds which resulted in a considerable saving in our building operations. It covers about 132 acres and contains a house, and a barn and sheds in which were also some farming implements. It was purchased for the sum of $4,900.00, which was drawn from the unexpended appropriation made by the legislature of 1909 for the purchase of a site. The acquisition of this additional land at a reasonable price, at this time, forestalls an exorbitant charge at some future time when more land will be needed, and also gives us ample growing room for many years to come; furthermore it avoids the necessity of the purchase of a right of way for our spur track and sewage system.

CONCERNING ADMISSION OF PATIENTS.

Since beginning our work of construction, the demands for admission have been numerous, insistent and persistent. At first, it was intended to equip a small wooden building, now occupied by the farmer, for the reception of patients, but, as we had no provision for housing attendants of the various kinds needed in such a place, and no adequate accessories, it was deemed inadvisable to begin to care for patients until we were properly prepared. Our experiences thus far in building have justified us in this decision. Furthermore, we were supported in this action by the advice not only of the executive department of our state government, but also by that of the heads of similar institutions in other states and kindred institutions in this state. We now feel that our institution will soon be opened for the reception of patients and when this takes place we will be prepared to care for them in such a manner as will be acceptable to them and their friends and creditable to our commonwealth. To do this, however, to complete our plans, we will require appropriations for the next two years which will provide such additions to our equipment as are outlined in the report of the Superintendent and to which your attention is earnestly directed.

The applications for admission, both formal and informal, outnumber the accommodations in process of construction, and an estimate of the number which other public institutions expect to transfer to our Colony shows that the additional accommodations asked for would soon be taken up. The experiences of like institutions in other states reveal such scant accommodations for this class of unfortunates and defectives that large waiting lists exist.

Respectfully submitted,
MAX MAILHOUSE,
CARL FOSTER,
WILLIAM L. HIGGINS,
EDWARD H. DEMING,
WILLIAM J. BARBER,
ZEBULON R. ROBBINS,
JOHN H. MOUNTAIN,
WILLIAM P. KELLEY,
Trustees.

Superintendent's Report.

To the Board of Trustees of the Connecticut Colony for Epileptics for the year ended September 30, 1911.

Gentlemen:

I herewith respectfully submit the First Annual Report of the Superintendent of the Connecticut Colony for Epileptics.

The commencement of operations for the definite establishment of the Connecticut Colony for Epileptics may be said to date from September 16, 1910, when your Board was appointed by Governor Frank B. Weeks, so that the present date practically ends the first year of your work, a year of very hard and important work on your part, requiring much time and thought and considerable anxiety, but on looking over what has been accomplished you have much ground for congratulations:

To establish an institution of this kind, that has to be practically for all time, it has to be planned very carefully as the whole future conduct of the institution depends somewhat upon how well everything has been planned in the beginning, a wrong move usually means much added expense later, and rectifying mistakes is usually very unsatisfactory.

When the Colony was established by act of the Legislature, August 10, 1910, there was only a comparatively small appropriation, so that after the purchase of the site little money was left for other purposes. It was especially difficult for your Board to proceed, but owing to the appreciation of the condition existing, on the part of the State Board of Control, you have been able to accomplish a great deal. At the present time you must all feel that the first mile-stone has been passed in a very satisfactory and encouraging manner, the Colony appears more real and tangible, as the time when you can admit the patients for which the institution is planned approaches; the consummation of which is greatly desired by those seeking admission as well as yourselves.

At the beginning the most pressing need was to develop plans as regards the conduct of the farm and this you vigorously entered into, purchasing a number of grade Holstein heifers, and a pure-bred bull, the nucleus of the future dairy of the Colony. This has been done so well that by the time we have to care for inmates we will have sufficient milk, a most important item in the care of such patients. To insure a healthy herd all animals responding to the test for tuberculosis have been slaughtered. In March, 1911, the milk not needed on the farm was shipped to Boston and since that date up to September 1, 1911, $446.57 has been realized from the sale of the milk.

Besides the development of the dairy, horses, pigs, farm tools and farm machinery have been purchased so that the farm equipment at the present time is such that the farming operations of the Colony can be conducted with advantage. The Superintendent's house, including office and Board Room has been equipped. The farmer's house has also been furnished.

Considerable time has been spent by your Board in planning what buildings should be erected first, estimating their probable cost, besides estimating the probable cost of developing the sewage disposal plant, of securing a sufficient and proper water supply and of building a spur track to connect with the yards of the Central Vermont Railroad at Mansfield Depot. Although the appropriation obtained from the General Assembly of 1911 was not as large as was desired, still, if properly used, a good start can be made.

In connection with the spur track, in order to obtain a right-of-way, the "Green" farm, consisting of 132.62 acres, was purchased in May, 1911. This farm is a very valuable addition to the property, it adjoins the property first purchased, and increases the area of the Colony to approximately 354 acres. Besides allowing you to build the spur track entirely on the Colony property this additional land allows of a much better means of developing the sewage disposal plant; it contains excellent building sites, increasing the area on which later to erect cottages for the care of patients. It also contains excellent sand and gravel for building purposes.

During the next two years the work before you will be very great. In the first place the different objects for which appropriations have been made will have to be carried out as vigorously as possible, so that everything can be ready for the admission of patients at the earliest date possible. The building of the spur track should be especially pushed, but it is also very important to secure a sufficient and proper supply of water. Definite and complete plans for the buildings to be erected should be obtained without delay, so that the erecting of the buildings can be proceeded with.

Besides carrying out the objects for which money has been appropriated it will be necessary to develop plans for the ensuing two years, estimating the probable cost of such, for the purpose of securing a sufficient appropriation from the General Assembly of 1913.

The number of applications for admission is increasing quite rapidly, some of the requests are urgent, so that when the time approaches for receiving patients at the institution we will find it difficult to care for more than a small percentage of those seeking admission.

During the year the Colony has been visited by two Legislative Committees—Committee on Humane Institutions, and on Appropriations. It has also been visited by the Secretary of the State Board of Charities, Mr. Charles P. Kellogg. August 23, 1911, the Connecticut Dairyman's Association held a meeting on the Colony grounds.

Your Board deserves the thanks of the State for the business-like manner in which you have taken up the work of the institution. The meetings of your Board have been well attended and you have expended much time and thought on all departments.

In conclusion I desire to express my thanks for your many kindnesses and for your patient consideration of the many matters I have had occasion to present to you.

Respectfully submitted,
DONALD L. ROSS,
Superintendent.

October 1, 1911.

Superintendent's Report.

To the Board of Trustees of the Connecticut Colony for Epileptics for the year ended September 30, 1912.

Gentlemen:

I herewith respectfully submit the Second Annual Report of the Superintendent of the Connecticut Colony for Epileptics.

The progress in the development of the Colony during the past year has been very marked, and the prospects for the future are very bright. It has been your most earnest desire, and mine, that no mistakes should be made, that the institution should be developed along definite lines, that all permanent developments should be the best that can be attained. Plans for the completed institution, as far as was possible, as well as those for the present had to be mapped out. I feel that an excellent beginning has been made but the work must be pushed along as rapidly as possible as there is yet much to be done before the institution can be opened for the admission of patients.

During the past year, many very difficult problems had to be solved, the development of an efficient sewage-disposal plant, securing an ample and proper supply of water, developing a power and heating plant, as well as securing plans, etc., for the construction of the new buildings. In addition to this, all the difficulties connected with the building of the spur track to connect with the railroad at this point, had to be overcome.

A brief review of what has already been accomplished will not be out of place. The building of the spur track was taken up first, and its completion hurried, so that all the material used in buildings to be erected could be delivered directly on the grounds, thereby reducing the cost of the buildings by reducing the cost of cartage, a sum of no small amount. The first car of freight was delivered over the spur track June 25, 1912. This track will always be a valuable asset to the institution as all coal and other kinds of freight can be delivered directly at points desired. The two ward buildings, for which money was appropriated, are well under way, the brickwork of both being about completed. These when completed will give room for 80 patients, 40 of each sex. The kitchen building is also well under way. The power and heating plant has occasioned considerable trouble as the amount of money appropriated for this purpose was rather small, besides some arrangement had to be made for a temporary laundry, for which no appropriation was made. To obviate much added expense in the future, when it becomes necessary to extend the size of the plant, the plans for our present needs had to be so made that the building would easily permit of enlargement without requiring us to undo what had already been done. This fact had to be constantly kept in mind. At this writing some of the difficulties have been surmounted and considerable progress has been made. The sewage-disposal plant was another difficult problem, but the plans are now well under way and I believe the solution will prove to be very satisfactory. As regards the water supply, this will be solved if the well now being put down will yield the desired amount and kind of water. The contour of the Colony land permits the building of a reservoir for water on the highest point to give sufficient pressure at the buildings.

Besides the above, the work on the farm has been pushed, an orchard of 9 acres has been planted, a new silo has been built, and many improvements have been made. The milk from the dairy we have continued to ship to Boston; $1,349.30 has been realized from the sale of milk during the year. An exhibit of our milk was made at the Connecticut Dairyman's Association and first honors were obtained for quality. The report of the farmer will be attached to this report, showing the production of the farm during the past year.

At this time it is necessary to outline our plans as regards our requirements in the way of appropriations from the Legislature for the coming two years, September 30, 1913, to September 30, 1915.

Our capacity should be increased above what we are now trying to provide. We will not be able to meet all the demands for admission unless the capacity is very considerably increased, besides the cost of maintenance, per capita, in a small institution is much greater than in a larger institution, especially where the institution is very small. In an institution where there is only one building for each sex, the opportunities of classifying the inmates as regards age, mental condition, etc., are very small.

I would advise asking the next General Assembly that the following sums be appropriated for the various purposes outlined, as follows:

$35,000.00 for building and equipping one 40 type cottage for males, similar in construction to cottages now being built.

$50,000.00 for building and equipping two 20 type cottages for girls. These being intended for those in better mental condition, and they should be built more like homes, containing their own separate dining rooms and kitchens.

$8,500.00 for heating and ventilating and for making the necessary connections for water, sewage and electric lighting, in the above cottages.

$6,000.00 for furnishing the three ward buildings for 80 patients.

$45,000.00 for building and equipping a dining room building to be attached to kitchen building at present being built, capable of seating at least 120 patients, also providing a separate dining room for employees. Under the present planned arrangement there are separate dining rooms in the basements of the two ward buildings, placed there temporarily as there were no other places available. This arrangement requires the carrying of all food some distance from the kitchen. When these rooms are abandoned as dining rooms they can be used for the purposes of a sewing room and work shops. I would advise that the new building be a two-story building so that the second floor can be used, partly as quarters for employees and partly as a temporary hall for religious services and entertainments of different kinds.

$4,500.00 for heating, ventilating and for making the necessary connections for water, sewage and electric lighting, in the dining room building.

$2,500.00 for equipping a dispensary and laboratory, for the nucleus of a medical library, for surgical instruments, etc. These are all very necessary for the conduction of an institution of this kind. This is urgently required as we have no fund at present we can draw on for these purposes. Such equipment goes very far in developing an institution with a proper medical spirit, making a progressive institution.

$2,500.00 for making necessary improvements in Cottage, Tenement House, and House on farm, last purchased, as quarters for our various employees. Toilet arrangements are necessary and some means of heating must also be developed. One of these buildings is in bad repair, needs to be re-shingled, etc. The porch of the Superintendent's house needs re-roofing.

$1,500.00	for establishing and equipping a local telephone system to connect office and different buildings. Additions can be made with little expense.
$2,000.00	for a refrigerator plant in connection with our cold storage. This will obviate building another ice house for some time, as with this our present ice house will meet our demands.
$2,000.00	for furnishings, etc., for administration office.
$1,500.00	for a piggery. In an institution there is always considerable refuse from kitchen, etc., which can profitably be fed to hogs. At present we have no place where they can properly be kept.
$2,000.00	for repairs to farm buildings and farm improvement. Both large barns need re-shingling, floors and supports in both horse and cow stables need replacing. There is much need of considerable underdraining and new fences are required on the farm.
$1,000.00	for walks between buildings and from highway to buildings.
$1,000.00	for grading around buildings and for building a road from highway to buildings.
$15,000.00	for a laundry building.
$20,000.00	for a permanent power house.
$3,500.00	for extra equipment to power house to meet the demand for heating and lighting proposed new buildings.
$2,500.00	for a coal trestle at power house.
$10,000.00	for architects and engineers.
$50,000,00	for maintenance.
$75,000.00	for an administration building. It would seem that it would be advisable to ask the Legislature for this sum at this time. This building will be a great necessity after the institution is opened.

Until such a building is erected the business of the institution will have to be conducted under many difficulties. Such a building besides giving room for offices both medical and business should have space for the following:—quarters for officers, also a kitchen and a dining room for them, a room for meetings of Board of Trustees, rooms for medical library, dispensary, etc. It should also contain a fire-proof vault for papers, records, etc. This building should be large enough for future requirements, and its architecture should be pleasing as it will form the most conspicuous part of the institution.

The past year has been a very strenuous one for your Board. Much time and thought have been expended by you, especially by the Building Committee, on whom much of the work fell. The work on your part will continue to be strenuous until the Colony can get well under way. If the next General Assembly will appropriate sufficient money to permit carrying out of the plans outlined for the next two years the Colony will then have a good start and your responsibilities will be considerably decreased. After that we must be guided very much by the urgency of the demands for admission.

I have again to thank you for your many kindnesses and for your continued patience in considering the many matters I have had to bring before you.

Respectfully submitted,
DONALD R. ROSS,
Superintendent.

October 1, 1912.

Treasurer's Report.

Report of W. P. Kelley, Treasurer of the Connecticut Colony for Epileptics, for the year ending September 30, 1911.

Receipts from all sources during the fiscal year were as follows:

Date	General Purposes	Farm	Land & Buildings	Total
Oct. 1910,	$2,000.00		$1,250.00	$3,250.00
Nov. 1910,		$150.00		150.00
Dec. 1910,	2,500.00			2,500.00
Jan. 1911				
Feb. 1911				
Mar. 1911,	2,500.00	21.20		2,521.20
Apr. 1911,	3,500.00	60.25	3,750.00	7,310.25
May 1911,		744.03		744.03
June 1911,	5,000.00	169.55		5,169.55
July 1911,		271.39		271.39
Aug. 1911,	3,000.00	64.50	4,500.00	7,564.50
Sept. 1911,	1,000.00	100.00		1,100.00
	$19,500.00	$1,580.92	$9,500.00	$30,580.92

Expenditures during the fiscal year were as follows:

Date	Administration	Farm	Land & Buildings	Total
Oct. 1910,		$950.00		$950.00
Nov. 1910,	$303.33	412.03		715.36
Dec. 1910,	108.25	1,101.50		1,209.75
Jan. 1911,	170.21	161.35		331.56
Feb. 1911,	300.50	647.59		948.09
Mar. 1911,	75.95	1,009.60		1,085.55
Apr. 1911,	190.36	3,821.63	$4,900.00	8,911.99
May 1911,	186.85	1,647.54		1,834.39
June 1911,	7.55	4,059.78		4,067.33
July 1911,	122.69	959.62		1,082.31
Aug. 1911,	84.52	2,050.66		2,135.18
Sept. 1911,	459.15	1,681.80		2,140.95
	$2,009.36	$18,503.10	$4,900.00	$25,412.46

Total disbursements for year		$25,412.46
Checks out, Nos. 267 and 268, for		6.46
		$25,406.00
Balance in Bank, Administration account	$ 574.92	
Balance in Bank, Land and Buildings account	4,600.00	$5,174.92
		$30,580.92

Cashiers' Certificates herewith.

W. P. KELLEY,
Treasurer.

Personally appeared before me, W. P. Kelley, Treasurer of the Connecticut Colony for Epileptics and made oath that the above is a true account.

FRANK W. BENNETT,
Notary Public.

Annual Report of W. P. Kelley, Treasurer of the Connecticut Colony for Epileptics, for the year ending September 30, 1912.

Receipts from all sources during the fiscal year were as follows:

Date	General Purposes	Farm	Land & Build'gs	Railroad	Arc'ts. Eng'rs	Ward & Kitchen	Total
Bal. Sept. 30	$ 574.92		$4,600				$5,174.92
Oct.	5,000.00	$140.24					5,140.24
Nov.		178.10					178.10
Dec.	2,500.00	185.08		$1,000			3,685.08
1912							
Jan.	2,500.00	222.44					2,722.44
Feb.		253.48					253.48
Mar.	2,000.00	25.00		2,000			4,025.00
Apr.	2,000.00	80.88					2,080.88
May		232.01		2,000	$2,000		4,232.01
June		219.81		2,000			2,219.81
July	2,000.00	195.70		5,000		$5,000	12,195.70
Aug.	4.00	192.95				10,000	10,196.95
Sept.	2,007.33	145.45				12,000	14,152.78
	$18,586.25	$2,071.14	$4,600	$12,000	$2,000	$27,000	$66,257.39

Expenditures during the fiscal year were as follows:

Date	General Purposes	Farm	Railroad	Arc'ts & Engineers	Ward & Kitchen	Total
1911						
Oct.	$162.06	$3,029.87				$3,191.93
Nov.	83.87	1,905.44				1,989.31
Dec.	248.94	1,988.13	$171.68			2,408.73
1912						
Jan.	309.93	1,422.65	31.16			1,763.74
Feb.	131.38	1,194.04				1,325.42
Mar.	184.33	1,171.95	1,787.38			3,143.66
Apr.	89.97	1,358.89				1,448.86
May	151.41	1,278.73	2,133.98	$1,872.60		5,436.72
June	47.82	1,174.22	1,998.20			3,220.24
July	98.39	1,017.39	2,561.14	100.79	$2,846.10	6,623.81
Aug.	70.13	1,314.32			9,296.29	10,680.74
Sept.	112.44	1,135.98			6,621.76	7,870.18
	$1,690.67	$17,991.61	$8,683.54	$1,973.39	$18,764.15	$49,103.36
Checks No. 267 and No. 268 drawn last year, paid this,						6.46
						$49,109.82

Report of Treasurer concluded on next page.

September 30, 1912

Balance in Bank, Land and Buildings acct.	$4,600.00	
Balance in Bank, Railroad acct.	3,316.46	
Balance in Bank, Architects and Engineers	26.61	
Balance in Bank, Ward, Kitchen, Dining Room	8,235.85	
Balance in Bank, Administration, Cur. Exp.	963.65	
		17,147.57
		$66,257.89

Cashiers' Certificates herewith.

W. P. KELLEY,
Treasurer.

Personally appeared before me, W. P. Kelley, Treasurer of the Connecticut Colony for Epileptics, and made oath that the above is a true account.

WILLIAM J. BARBER,
Justice of the Peace.

State Comptroller's Office,
Dec. 1st, 1912.

This certifies that the accounts of The Connecticut Colony for Epileptics for the two fiscal years ended September 30th, 1912, have been duly examined and approved by this office.

F. C. BISSELL,
Deputy Comptroller.

Superintendent's Financial Report.

September 30, 1912.

Dr.

	Received from Treasurer	Miscellaneous Receipts	Total
1911			
February		$ 5.70	$ 5.70
March		15.50	15.50
April		43.63	43.63
May		28.00	28.00
June	$1,014.37	1.65	1,016.02
July	450.02	2.00	452.02
August	557.73	.75	558.48
September	592.66	.50	593.16
October	580.54	27.05	607.59
November	505.31	3.00	508.31
December	554.40	13.31	567.71
1912			
January	630.46	25.95	656.41
February	586.33	113.78	700.11
March	581.56	15.25	596.81
April	565.29	106.61	671.90
May	580.03	44.80	624.83
June	642.94	15.00	657.94
July	664.67	73.35	738.02
August	778.52	13.70	792.22
September	669.67	19.58	689.25
	$9,954.50	$569.11	$10,523.61

Cr.

	Paid for Labor	Paid to Treas.	Total
1911			
March		$ 21.20	$ 21.20
April		0.00	0.00
May		43.63	43.63
June	$1,014.37	29.65	1,044.02
July	450.02	2.00	452.02
August	557.73	0.00	557.73
September	592.66	1.25	593.91
October	580.54	0.00	580.54
November	505.31	30.05	535.36
December	554.40	0.00	554.40
1912			
January	630.46	13.31	643.77
February	586.33	139.73	726.06
March	581.56	0.00	581.56
April	565.29	15.25	580.54
May	580.03	106.61	686.54
June	642.94	44.80	687.74
July	664.67	15.00	679.67
August	778.52	73.25	851.87
September	669.67	33.28	702.95
	$9,954.50	$569.11	$10,523.61

Statistical Form for State Institutions.

CONNECTICUT COLONY FOR EPILEPTICS.

Population for the two years ended September 30, 1912.
Institution not ready for the admission of patients.

Expenditures for two years ended September 30, 1912.

Current Expenses.

1,	Salaries and wages	$11,274.20	
2,	Subsistence	1,880.23	
3,	Furniture and Bedding	4,255.05	
4,	Ordinary Repairs	2,534.83	
5,	Office, Domestic and Outdoor expenses	18,645.37	
6,	Total gross current expenses	38,589.68	
7,	Less earnings and sales	3,652.06	
8,	Total net current expenses		$34,937.62
	Extraordinary Expenses.		
9,	New Buildings, Land, etc	$34,321.08	
10,	Permanent improvements to existing buildings	1,605.06	
11,	Total Extraordinary Expenses		35,926.14
12,	Grand total of all expenses		$70,863.76

Employees, length of service, and salaries of all persons employed at the Connecticut Colony for Epileptics during the two years ended September 30, 1912, whose compensation was not less than $450.00 per annum. (Sec. 185 Revised Statutes of 1902.)

Position	Length of Service	Compensation
Superintendent,	20 months	$211.66 per mo. with maintenance self and family.
Farmer,	15 months	$61.66 per mo. and maintenance.
Farmer,	4 months	$41.66 per mo. and maintenance.

Farmer's Report.

For the year ended September 30, 1912.

Ensilage	160 tons at $4.00	$ 640.00
Hay	75½ tons at $25.00	1,887.50
Potatoes, 1st	278 bush. at .75	208.50
Potatoes, 2nds	200 bush. at .25	50.00
Summer Squash	10 bush. at .50	5.00
Cabbage	100 heads at .05	5.00
Carrots	16 bush. at .40	6.40
Beets (table)	6 bush. at .45	2.70
Beans (string)	15 bush. at .45	6.75
Beans (lima)	10 bush. at $1.00	10.00
Sweet Corn	75 doz. at .10	7.50
Cucumbers	20 bush. at .50	10.00
Tomatoes	10 bush. at .45	4.50
Radishes	12 bush. at .45	5.40
Celery	600 heads at .05	30.00
Parsley	25 bunches at .10	2.50
Peas	8 bush. at $1.25	10.00
Apples	31 bbls. at $2.00	62.00
Pears	3 bush. at $1.00	3.00
Turnips	7 bush. at .90	6.30
Cider	50 gals. at .10	5.00
Milk (sold)		1,349.50
Pigs (sold)	27	79.00
Calves (sold)	6	18.00
Miscellaneous sales		322.32
		$4,736.87

INVENTORY OF LIVE STOCK, SEPT. 30, 1912.

Horses	6
Colts	1
Bulls	1
Cows	17
Young Stock	12
Calves	7
Steers	2
Hogs	2
Shoats	3
Young Pigs	16

State of Connecticut
PUBLIC DOCUMENT NO. 57

REPORT

OF

Connecticut Rivers, Harbors and Bridges Commission

TO THE

GENERAL ASSEMBLY

For two years ended December 31, 1912

PRINTED IN COMPLIANCE WITH STATUTE

HARTFORD
Published by the State
1913

PUBLICATION

APPROVED BY

THE BOARD OF CONTROL

C. M. GAINES, HARTFORD, CONN.

LETTER OF TRANSMISSION.

To the Honorable Senate and House of Representatives, assembled:

GENTLEMEN:—

In compliance with Senate Bill No. 322 we herewith submit our report for two years, ending December 31, 1912.

EDWARD H. WARNER, Chairman, of Hartford.
FRANK V. CHAPPELL, Secretary, of New London.
WILLIAM H. CADWELL, of New Britain.
WILLIAM I. KINNEY, of New Haven.
THOMAS F. NOONE, of Rockville.

(Senate Bill No. 332.)

CHAPTER 105.

An Act Concerning the Appointment, Powers and Duties of Commissioners of Rivers, Harbors and Bridges.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. The governor shall, on or before July 1, 1911, nominate and, with the advice and consent of the senate, appoint five commissioners of rivers, harbors, and bridges, two to hold office for the term of two years, two for the term of four years, and one for the term of six years, from July 1, 1911, and until their respective successors are duly appointed and qualified; and biennially thereafter the governor shall nominate and, with the advice and consent of the senate, appoint two such commissioners, each for the term of six years and until his successor is duly appointed and qualified, except that in the years in which the term of only one commissioner expires one commissioner shall be so appointed. One of the commissioners shall be a capable and experienced civil engineer of at least ten years' practice, one shall be a lawyer of good standing in his profession, and the remaining commissioners shall be practical business men. If any vacancy occurs at a time when the general assembly is not in session, the governor shall appoint a commissioner to fill such vacancy for the remainder of the term.

SEC. 2. The comptroller shall furnish to said commissioners an office in the capitol, wherein maps, surveys, and other documents in connection with rivers, harbors, and bridges of the state, and other matters within the jurisdiction of the commissioners shall be kept and shall be open to inspection by the public.

SEC. 3. Said commissioners shall, on behalf of the state, consult and cooperate with the federal authorities regarding any river or harbor improvement or the construction of any bridge over navigable waters within the state; shall cause surveys to be made, by or under the direction of the engineer member, of navigable waters or extensions thereof or of waters that may be made navigable, or for the protection of river banks against erosion or damage to public or private property; shall confer with municipalities concerning water terminal facilities, and promote, where possible, greater coordination between water and rail transportation, and advise relative to the proper mechanical devices for handling freight; and shall adopt such other means, by surveys and recommendations, as will conserve and develop transportation by water. Said commission shall report to the general assembly on the first Wednesday after the first Monday in January, 1913, and biennially thereafter.

SEC. 4. The comptroller is hereby authorized and directed to draw his orders on the treasurer for a sum or sums not exceeding in the aggregate the sum of twenty-five hundred dollars to pay for clerical or other assistance for the commission and also the necessary expenses of the members of the commission in the performance of their duties, but the members of said commission shall serve without compensation.

SEC. 5. This act shall take effect from its passage.

Approved, June 22, 1911.

It is our sad duty to report that on July 26, 1912, Commissioner Oliver Gildersleeve was suddenly stricken and taken from us. By his devotion to duty, his sincere belief in the development of the waterways of the state, his unfailing courtesy and his sterling character he endeared himself to all who were so fortunate as to know him. He was born at Gildersleeve, Conn., which was his lifelong home, March 6, 1844, and was interested in all that would better the state civically, commercially and religiously. With his sons he conducted a shipbuilding yard on the Connecticut river and was connected with many financial, manufacturing and shipping enterprises. Not only has the Commission lost a respected advisor, but the state has lost an earnest advocate.

Mr. Thomas L. Kinney of New Haven was appointed by Governor Baldwin to fill the unexpired term of Mr. Gildersleeve.

INTRODUCTORY.

The Rivers, Harbors and Bridges Commission was instructed by the General Assembly of 1909 to make an investigation of the rivers and harbors of the state and report their findings to the session of 1911. This was done to the best of their ability with the means and time at hand and a report submitted in printed form.

This report contained the then obtainable facts concerning our neglected waterways and at the same time endeavored to show in an interesting way the manner pursued by foreign countries in developing their harbors, rivers and terminal facilities. The report contained about 80 pictures elucidating vividly the magnificent efficiency obtained and showing conclusively to those acquainted with our ports the lack of terminal facilities and the apparent lethargy of the people of the state in allowing those ports that are susceptible of tremendous improvement to remain almost idle.

It will be noted by referring to the Commission's report of 1910 that statistics were given showing the position of the state among those of the Union in reference to its manufactures. In this report we bring them up to date. It is not incongruous to associate manufactures with waterway problems; because Connecticut being preeminently a manufacturing state, must fully recognize that in its continued prosperity, transportation by water is a vital factor to be reckoned with.

It is interesting to study the table of manufactures and to note the increase in the past decade of the manufactured product. Closely associated with it is the increased population, it being the wage-earner who contributes to this increase to the largest degree and not the agriculturist. Since 1879 there has been a decrease in the acreage of corn, oats, rye, hay and potatoes, while tobacco is the only agricultural product to gain acreage in the interim.

However, the value of the agricultural product has increased almost $10,000,000 in the last ten years. Intensive farming will still further add to the value of this important industry. While the increase in the value of the manufactured product has increased 31.7% since 1900, which is noteworthy, yet note the rank of the state among its 48 sisters. From 8th to 12th place in the last ten years, which brings it vividly to the mind that four states have come from below us, equaled us and passed us. In 1850 the state's proportion of the total value of product in the United States was 4.6%, in 1900 2.8%, and in 1910 2.4%. The tables showing the value of products in the leading cities and boroughs and the amount of capital invested are worthy of close study. After giving the facts herein shown due consideration and keeping in mind constantly that we are one of the

New England States, on the northeast seaboard, far removed from the field of raw material, and remembering that a recent census report showed that the staple growing cotton states of the South consumed more bales of cotton last year in their mills than did the mills of New England, thus rising from the position of practically not a mill at the close of the war, and not entering the era of great development until about 1890, we are forced to note that in a period of about 20 years the South has passed New England, yet we have made great strides in the cotton industry. One thing is evident from the foregoing facts and many others that may be cited: we must do two things that are pressing, first, improve our transportation facilities by the development to the highest degree of efficiency, our rivers and harbors and construct canals where feasible, so that our industries may receive their raw material at the lowest possible freight rates and with the necessary expedition and may in turn ship the manufactured product in the same cheap and expeditious manner. This means proper coordination of rail and water carriers, proper terminal facilities and the improvement of our many natural waterways so that we may lead instead of being led. Second, to make in our factories a product always a little better than the factories elsewhere make.

We do it now through years of experience. To continue, we should establish proper technical and manual-training schools. These two things we can do and thus maintain our place among the manufacturing states, keep our industries, get more, add to our population and be a recognized factor in the trade of the world.

CONNECTICUT.

Manufactures.

	1900	1905	1910
Population,	908,420	*	1,114,756
Persons engaged in manufactures,	168,991	198,046	233,871
Number of establishments,	3,382	3,477	4,251
Primary horse power,	256,331	304,204	400,275
Capital,	$299,206,925	$373,284,000	$517,547,000
Value of products,	315,106,000	369,082,000	490,272,000
Rank of state in manufactures,	8th	11th	12th

Agriculture.

Value of product,	$28,276,948		$37,493,836
Rank of state in agriculture,	38th		39th

* No census.

LEADING MANUFACTURING CITIES AND BOROUGHS OF THE STATE SHOWING VALUE OF PRODUCT, RANK AND POPULATION.

	1900	1905	1910	Rank	Pop. 1910
Bridgeport,	$33,536,000	$44,587,000	$65,609,000	1	102,054
Hartford,	23,829,000	25,974,000	40,680,000	4	98,915
New Haven,	34,899,000	39,666,000	51,071,000	2	133,605
Waterbury,	30,330,000	32,367,000	50,350,000	3	73,141
Meriden,	11,750,000	13,764,000	16,317,000	7	32,066
New Britain,	11,096,000	14,960,000	22,021,000	5	43,916
Ansonia,	18,515,000	19,132,000	20,088,000	6	15,152
Torrington,	9,178,000	9,674,000	12,550,000	8	16,840
Naugatuck,	8,887,000	11,010,000	11,033,000	9	10,541
Danbury,	6,527,000	8,066,000	10,318,000	10	23,502
Norwich,	5,935,000	6,022,000	9,389,000	11	28,219
Stamford,	3,920,000	5,890,000	8,740,000	12	28,836
Willimantic,	3,023,000	4,902,000	6,733,000	13	11,230
Middletown,	4,152,000	4,351,000	4,955,000	14	20,749
New London,	4,221,000	4,710,000	4,483,000	15	19,659

CAPITAL INVESTED IN MANUFACTURES IN CITIES OF THE STATE.

	1900	1905	1910
Bridgeport,	$31,625,000	$49,381,000	$62,779,000
Hartford,	28,057,000	28,359,000	48,085,000
New Haven,	27,962,000	31,413,000	52,014,000
Waterbury,	21,967,000	32,950,000	44,653,000
Meriden,	15,417,000	16,442,000	17,675,000
New Britain,	13,768,000	19,980,000	31,790,000
Ansonia,	6,240,000	7,626,000	9,763,000
Torrington,	6,039,000	9,157,000	15,692,000
Naugatuck,	6,607,000	7,900,000	8,642,000
Danbury,	3,423,000	4,037,000	7,786,000
Norwich,	6,438,000	8,475,000	12,531,000
Stamford,	4,813,000	7,526,000	11,926,000
Willimantic,	5,621,000	6,682,000	9,919,000
*Middletown,	4,816,000	3,583,000	3,544,000
New London,	4,256,000	4,590,000	5,467,000

* Does not include the town of Middletown which was included in the census of 1900.

It is a source of gratification to the Commission and we hope it will be to the state, to know how well the first attempt to bring out conditions was received throughout the United States. It was necessary to have three editions printed to supply the demand; hence beyond doubt Connecticut now takes a place among the states of the Union, as at least endeavoring to improve her waterways for the use of the manufacturer, the business man and the people as a whole. The War Department through the Board of Engineers of the United States Army requested a supply of the reports, they placing one in the hands of every division engineer in the country. Letters were received complimenting the publication from the engineers.

Referring to the Report, on December 7, 1911, Brig-Gen. William H. Bixby, Chief of Engineers, U. S. Army, said in part in a speech before the National Rivers and Harbors Congress at Washington, D. C.:

"This year, just as much as last year, one of the features most urgently requiring your careful consideration is the development of improved terminals, and their municipal control, as well as the enactment of such state and federal legislation as will require all railroad lines to transfer to water lines, and to give through bills-of-lading and the use of all their loading and transfer facilities to any freight which shippers may desire to have consigned over mixed railroad and water routes. There have been published during the past year several pamphlets of great value on the subject of terminal facilities; as those by Professor Clapp, of New York University, on the navigable Rhine and on the Port of Hamburg, and those of the New York City Dock Commission, and the *Connecticut State Rivers and Harbors Commission* wherein much detail is given to the best arrangement of docks, etc."

We reproduce below several letters to show that other sections of the country are thoroughly alive to the development of their waterways and terminal facilities and appreciate what the State of Connecticut is endeavoring to do.

MISSISSIPPI RIVER COMMISSION.

Fourth District.

Metropolitan Bank Building.

NEW ORLEANS, LA., February 21, 1912.

MR. EDWARD H. WARNER,
Chairman, Rivers and Harbors Commission, State of Connecticut,
Hartford, Conn.

Dear Sir:—I beg to acknowledge receipt of the report of your Commission on the Rivers and Harbors of Connecticut with the memoir by Mr. Frederick L. Ford upon certain European ports. I have read this with much interest and congratulate you upon the completeness with which the work of the Commission has been carried out. This report will be placed on file for official use in this office, and any further publications of a similar nature issued by you, we will be very glad to receive. Thanking you, I am

Yours very truly,
C. V. SHERRILL,
Captain, Corps of Engineers.

ISTHMIAN CANAL COMMISSION.

Canal Zone.
EMPIRE, February 23, 1912.

MR. EDWARD H. WARNER,
Chairman, Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I beg to acknowledge with many thanks the receipt of a copy of the Report of Connecticut Rivers and Harbors Commission, 1910, furnished by you and sent to the officers of the Corps of Engineers by the Chief of Engineers, U. S. A.

I shall read with much interest this valuable report which comes at a very opportune time, now that we are planning and constructing terminal facilities for the Panama Canal at both the Atlantic and Pacific entrances.

Very respectfully,
D. D. GAILLARD,
Member Isthmian Canal Commission.

Department of
Practical Military Engineering.

UNITED STATES MILITARY ACADEMY.

WEST POINT, NEW YORK, February 16, 1912.

MR. EDWARD H. WARNER,
Chairman, Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I take pleasure in acknowledging receipt of the report of the Commission of which you are chairman, transmitted to me through the Chief of Engineers, U. S. A.

It places a great deal of valuable information in a compact and interesting form and I desire to thank you for the copy sent me.

Yours truly,
G. A. YOUNGBERG,
Captain, Corps of Engineers.

WAR DEPARTMENT,

UNITED STATES ENGINEER OFFICE.

New York, District No. 1.

Room 710, Army Building, 39 Whitehall Street.

New York City, February 20, 1912.

Mr. Edward H. Warner,
Chairman, Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I have received through General W. H. Bixby, Chief of Engineers, U. S. A., a copy of the "Report of Connecticut Rivers and Harbors Commission, 1910." This report will be of valuable assistance to this office in connection with the question relating to terminal facilities and port developments.

Very respectfully,
W. M. BLACK,
Colonel, Corps of Engineers, U. S. A.

ATLANTIC DEEPER WATERWAYS ASSOCIATION.

The Crozer Building.

Philadelphia, Pa., February 21, 1912.

Mr. E. H. Warner,
Hartford, Conn.

Dear Mr. Warner:—This office is in receipt from General Bixby, Chief of Engineers, U. S. A., of a copy of the 1910 Report of the Rivers and Harbors Commission of the State of Connecticut, and I want to take this opportunity to congratulate you upon this well deserved recognition of your work as Chairman of the Commission.

With best wishes, I am

Yours very truly,
DURELL SHUSTER,
Assistant Secretary.

OFFICE OF SUPERINTENDENT,

STATE, WAR AND NAVY DEPARTMENT BUILDING.

Washington, D. C., February 23, 1912.

Mr. Edward H. Warner,
Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I have received from the Chief of Engineers a copy of the report of your Commission for 1910, containing much interesting information both about your state and about European harbors. This report is a valuable contribution to the literature on river and harbor engineering, and I beg you to accept my thanks for the copy furnished me.

Yours truly,

U. S. GRANT 3rd.

Captain, Corps of Engineers.

UNITED STATES ENGINEER OFFICE.

Upper Mississippi River Improvement.

Rock Island, Ill., May 31, 1912.

Mr. Edward H. Warner,
Chairman of Rivers and Harbors Commission, State of Connecticut,
Hartford, Conn.

Dear Sir:—Some time ago, while absent in Panama, I received from General Bixby a copy of the report of your Commission for the year 1910. Reading this report has been delayed until recently.

I now take the liberty of expressing to you my high appreciation of your public-spirited labor, which has placed at the disposal of all interested a large amount of useful and well selected information.

Very respectfully,

C. KELLER,

Major, Corps of Engineers.

COMPANY "A," 1ST BATTALION OF ENGINEERS.

Washington Barracks, D. C., February 16, 1912.

Mr. Edward H. Warner,
Chairman, Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I have the honor to acknowledge the receipt of the "Report of the Rivers and Harbors Commission of the State of Connecticut," which I have examined with considerable interest.

It is a great pleasure to those of the Federal River and Harbor service to note the interest displayed by the state in connection with its natural waterways and with the necessity for terminal facilities, especially when the results are set forth in a report such as you were kind enough to send me.

Very respectfully,

C. W. ORWELL,

Captain, Corps of Engineers.

THE ARMY SERVICE SCHOOLS.

FORT LEAVENWORTH, KANSAS, February 17, 1912.

MR. EDWARD H. WARNER,
Chairman, Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I have just received through the office of the Chief of Engineers, U. S. A., a copy of your report of 1910.

I wish to thank you for this most interesting report. The subject of terminal facilities is the most difficult and important one to be considered in the development of our water-borne commerce; and I do not believe that the problem can be solved correctly until the Federal Government, the State Government and the municipalities take it up. No symmetrical development will result if the matter is left to private interests.

Very respectfully,
W. L. GUTHRIE,
Captain, Corps of Engineers.

FORT BAYARD, N. M., February 27, 1912.

MR. EDWARD H. WARNER,
Chairman, Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Dear Sir:—I have read with great appreciation the report of your Commission for 1910, copy of which, through your kindness, was sent by the Chief of Engineers, U. S. A., to the U. S. Engineer's Office at Los Angeles, Cal.

The great subject of port development is intensely interesting to me, for until a recent breakdown from overwork, I was in charge of United States river and harbor work in southern California, where both San Diego and Los Angeles are at present making great studies in development of port facilities.

Your report is such a valuable one that I would greatly appreciate the favor if you would send me a copy for my personal library and for further study, for the copy I have been reading must be returned to Los Angeles. Franked envelope for transmission of the above report is enclosed.

Very respectfully,
CHAS. T. LEEDS,
Captain, Corps of Engineers, U. S. A.

WAR DEPARTMENT,

UNITED STATES ENGINEER OFFICE,

723 Central Building.

Los Angeles, Cal., March 16, 1912.

Mr. Edward H. Warner,
Chairman, Rivers and Harbors Commission,
Hartford, Conn.

Sir:—I have received from the Chief of Engineers, U. S. A., a copy of the 1910 Report of the Rivers and Harbors Commission of the State of Connecticut and desire to say that I have read the same with great pleasure and profit. It is particularly interesting and useful at this place where the subject of terminal facilities and port development is receiving close consideration with a view to making the Port of Los Angeles a harbor of the first class.

Very respectfully,
C. H. McKINSTRY,
Major, Corps of Engineers.

ISTHMIAN CANAL COMMISSION.

Washington Office.

January 10, 1912.

Mr. Edward H. Warner,
Chairman, Connecticut Rivers and Harbors Commission,
Hartford, Conn.

Sir:—This office is in receipt of a communication from Colonel George W. Goethals, U. S. A., Chairman and Chief Engineer of the Isthmian Canal Commission, requesting that there be obtained, for the official use of the Commission on the Isthmus, three copies of a report submitted by you in 1910, under House Joint Resolution No. 331, including its study of representative European ports by Frederick L. Ford.

This office has been unable to obtain copies of the report mentioned, or to ascertain whether the same has been published as a public document. If practicable, therefore, will you kindly furnish this office three copies of this report for transmission to Colonel Goethals on the Isthmus, or advise me where the same may be obtained?

Very respectfully,
F. C. BOGGS,
Major, Corps of Engineers, U. S. A., Chief of Office.

Many other requests for the report have been received from municipalities, harbor boards, universities, libraries and other interests throughout the United States as well as from other countries.

During the years 1911 and 1912 your Commission has been as active as their personal affairs would permit and have attempted in every way to bring about a better understanding of the necessity of improving our waterways and the advantages to be gained in treating the subject in a comprehensive manner to attain the greatest benefits for the shippers and other users of the rivers and harbors.

There have been held ten regular meetings, and nine special meetings concerning the New London Terminal, also numerous subcommittee meetings and informal meetings where less than the whole Commission was present.

The Commission was represented at the Convention of the Atlantic Deeper Waterways Association at Richmond, Va., in October, 1911, by Chairman Warner and Commissioners Cadwell, Chappell and Gildersleeve. Mayor Mahan and many others from New London were also present and through the effort of all, New London was selected as the place for the Convention of 1912. At Richmond, Troy, N. Y., was the strongest competitor, being represented by 45 members of the Chamber of Commerce and a band.

At this Convention at which 700 delegates from the seaboard states were present, Mayor Mahan spoke for New London and Chairman Warner responded for the State of Connecticut. Here the report of the Commission was sought and a special issue of the *Hartford Post* was distributed containing an article on the Connecticut River.

In December the Commission was represented at the National Rivers and Harbors Congress at Washington by Chairman Warner and Commissioners Cadwell, Gildersleeve and Chappell. This Congress is held at the time of the opening of the National Congress to impress upon the lawmakers the urgent necessity of a systematic development of the nation's waterways and to provide for a policy, not a project. There were over 1,000 delegates representing nearly every state in the Union, and speeches were made by Secretary of War Stimson; Dr. David Kinley, Ph. D., LL. D., Director University of Illinois; Hon. Joseph E. Ransdell, M. C., its president, who becomes United States Senator from Louisiana March 4, 1913; Hon. J. Hampton Moore, M. C., from Pennsylvania; Hon. Walter L. Fisher, Secretary of Interior; Brig.-Gen. W. H. Bixby, Senator Duncan U. Fletcher, Florida; Mr. August Belmont, New York; Hon. George W. Guthrie, Ex-Mayor of Pittsburgh; Mayor Gaynor, of New York; Governor Hadley, of Missouri, and many other distinguished gentlemen.

The Connecticut delegation met and selected the late Oliver Gildersleeve as State Vice-President for 1912, and E. H. Warner to reply to the roll on behalf of this state. These meetings are exceedingly interesting and give the delegates an excellent opportunity to learn what is going on concerning the waterways of the nation.

The Commission was represented at the XII International Congress of Navigation at Philadelphia in May, 1912, by Chairman Warner. There were 47 nations represented here and in order to show the representatives of the many nations every courtesy and to let them see as much as possible of the United States, the Federal Government appropriated $50,000, the

City of Philadelphia $50,000, and the State of Pennsylvania $25,000. Canada also provided the delegates with a trip through the Dominion at her expense to show what was being done with her waterways.

The Congress was welcomed by President Taft and by Mayor Blankenburg of Philadelphia, who addressed them in English, French and German, much to their delight. The meetings were divided into sections, one section dealing with Ocean Navigation, the other with Inland Navigation. The amount of knowledge to be gained at meetings of this character cannot be overestimated and is bound to be of a beneficial character to the state, bringing Connecticut into favorable position with the other states. Trips were provided without expense, to the coal fields, to Bethlehem Steel Works, to Trenton potteries, to Cramps and the New York shipbuilding plants, League Island navy yard, also to Washington, Harrisburg and Pittsburgh, the principal expenses being borne by the joint committees. A trip to Cape Cod Canal, one to New York thence up the Hudson to West Point and on to Albany, were also among the features. The latter trip was extended from Albany to Troy, Waterford, Schenectady, Fort Plain, Little Falls, Syracuse, Rochester, Lockport, and Buffalo to study the great New York State Barge Canal. Then to Sault Ste. Marie, Chicago and Gary.

The representatives of the foreign Government and commercial bodies as well as shipping companies were loud in their praise of the treatment they received in America. Your Chairman went over the Barge Canal and studied its immense proportions and realized its future benefit to all of southern New England through the new shipping routes of adequate dimensions that will be afforded.

The state again had its opportunity to contribute the Commission report to take its place among the publications of the various states, cities and those of Canada which were provided the delegates.

The Annual Convention of the Atlantic Deeper Waterways Association at New London in September, 1912, was another gathering of the advocates of the Intra-Coastal Waterways project at which the Commission was represented. This Convention was a revelation to the people of Connecticut who attended, giving them an opportunity of noting the enthusiasm with which the demand for the inland waterway on the Atlantic coast was being pushed forward, also of meeting men from every state from Maine to Florida. There were about 1,000 delegates and guests present, thus honoring Connecticut with the largest convention yet held by this organization. Here President Taft addressed the delegates and people of New London. The Navy Department ordered the battleship Illinois and two training ships into the harbor. The War Department fired the mortar batteries on Fishers Island at moving targets and the coast artillery gave a dress parade for the delegates. Trenton, Albany and Troy each came with large representative delegations, each with a band. Jacksonville, Fla., however, won the 1913 Convention through the energy of Mayor Jordan and his supporters. The National

Rivers and Harbors Congress again met in Washington, D. C., December 4, 5 and 6, 1912. This Commission was not represented.

The state was represented by J. Arthur Allen, New London, Captain Thomas Hamilton, New London, and R. W. Miller of Bridgeport. These gentlemen were appointed by Governor Baldwin and like most of the advocates of waterway improvement, attended at their own expense.

The State Business Men's Association was represented by Frank H. Johnston of New Britain, F. S. Valentine of Derby, and A. W. Burritt of Bridgeport. Other associations including those from Hartford, Bridgeport, New Haven, Derby, Ansonia, Middletown, New Britain and Shelton sent representatives. The Hartford Business Men's Association has been represented regularly at these meetings since 1908. Mayor B. F. Mahan represented the City of New London, Mayor F. C. Murphy the City of Norwich and Mayor Joseph A. Halloran the City of New Britain. The entire Connecticut delegation numbered 27, which is an increase over previous years and reflects the increasing interest in waterway development.

The Commission was represented by the Chairman at the initial meeting of officials of United States ports at the Chamber of Commerce, New York, December 9-10, 1912. Representatives were present from Pacific, Gulf, Atlantic and Lake ports. A permanent organization was effected, known as the National Association of Port Authorities. This association intends to meet yearly, or oftener if possible, to discuss port organization, traffic regulations and charges, and terminal facilities. Also to exchange views upon all important subjects relating to shipping and to act as a sort of clearing house for exchange of information. Mr. Calvin Tomkins, Commissioner of Docks and Ferries in New York, was selected as President.

The Chairman and Commissioner Noone attended the hearing of the Commerce Committee of the United States Senate at Washington in February, 1912, concerning the right to dam the Connecticut river at Windsor Locks, Conn., which right was sought by the Connecticut River Co., the Northern Connecticut Power Company and the Enfield Power Company, which is referred to in detail upon page 31.

The Commission was represented before the United States Army Engineers at New London concerning the draw in the new East Haddam Bridge, Mr. F. V. Chappell appearing. The location of the draw and its length, 461 feet, thus giving two openings of 213 feet in the clear, which is ample for present and future navigation, was found satisfactory to the Commission.

The Commission was represented at a hearing held in Springfield, and one in Holyoke, in September, by the Chairman and Commissioner Cadwell. These hearings appertained to opening navigation of the Connecticut river between Hartford and Holyoke, Mass., and were conducted by the Connecticut Valley Waterways Board—a special commission raised by the General Court of Massachusetts, 1912 session, for the purpose of investigating conditions and reporting to the next General Court their findings and recommendations. This Commission is composed of Mr.

W. S. McNary, Chairman, who is also chairman of the Harbor and Land Commission of Massachusetts, Mr. Chas. P. Chase, President of the Springfield Board of Trade, and Mr. J. J. O'Donnell of Holyoke, publisher of the *Holyoke Telegram*. The first hearing was held at Holyoke in the rooms of the Board of Trade and was attended by fully 400 intensely interested manufacturers, business men and others of this thriving Massachusetts city. Among those who spoke in favor of navigation to Holyoke were, Governor E. N. Foss of Massachusetts, Mayor John J. White of Holyoke, W. H. Bullard, President of the Holyoke Board of Trade, H. B. Freeman, Jr. of Hartford, Commissioner W. H. Cadwell of New Britain and Chairman Warner. The Connecticut speakers agreed with the Massachusetts gentlemen that ways and means should be found whereby navigation could be opened at the earliest possible moment, thus giving Windsor, South Windsor, East Windsor, Windsor Locks, Warehouse Point, Suffield, Enfield and Thompsonville, Conn., Longmeadow, Springfield, West Springfield, Brightwood, Chicopee, Willamansett and Holyoke, Mass., with a combined population of 212,392 (census of 1910), the desired competition, and serve this 35-mile stretch of river again with steamboat and barge traffic with modern boats and up-to-date terminal facilities.

INSPECTION TRIP.

On October 8, 9 and 10, 1912, the Commission made an inspection trip covering the Connecticut river to its mouth from Hartford, the Thames river to Norwich, thence to Duck Island Harbor of Refuge, and New Haven Harbor, a short distance up the Quinnipiac, thence to Bridgeport Harbor, Black Rock Harbor, South Norwalk and Stamford Harbors.

On account of lack of time and bad weather the coast easterly from New London was not inspected and the Housatonic river and several of the smaller harbors were passed by. The trip proved very instructive, and through many prominent officials and business men who accompanied the Commission on various parts of the route, it was possible to gain a large amount of first-hand knowledge otherwise unobtainable. Among those interested and who favored the Commission with their presence were:

Senator Edward W. Hooker, Hartford.

Mr. Augustine Lonergan, Hartford, Congressman-elect.

Mr. E. S. Belden, Hartford, Breakwater Contractor.

Mr. A. E. Jones, Hartford, Harbor-Master.

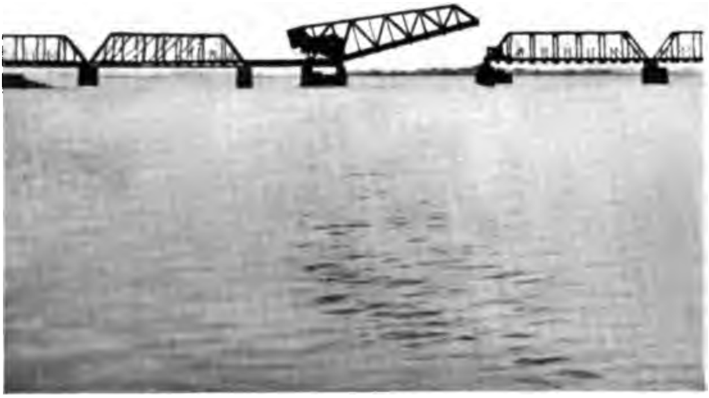
Mr. T. J. Kelley, Hartford, Secretary Board of Trade.

Mr. E. M. Dexter, Hartford, President Business Men's Association.

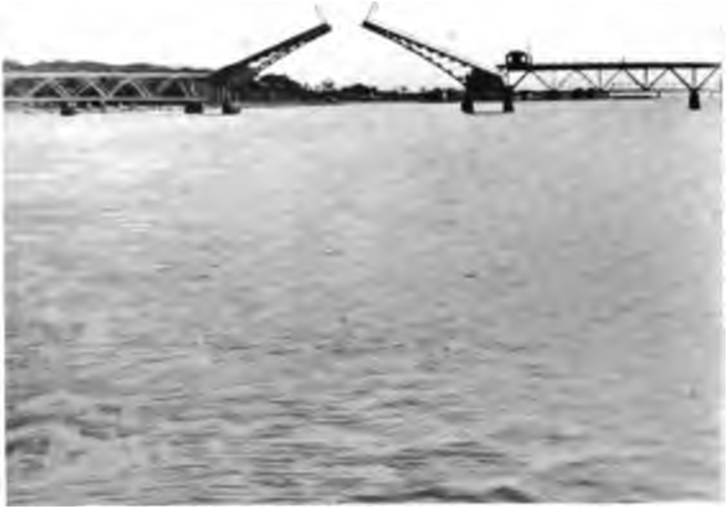
Mr. J. M. Merrow, Hartford, Hartford County Manufacturer's Association.

Mr. L. F. K. Whitman, Hartford, Hartford County Manufacturer's Association.

Mr. S. F. Willard, Wethersfield, President Business Men's Association.

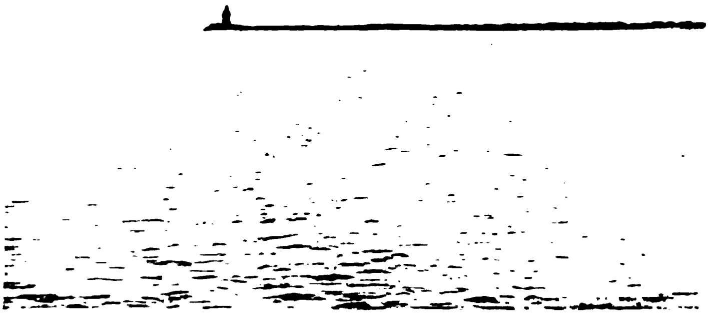


Shore Line Railroad Bridge, mouth of Connecticut River.
Length of Roller Lift Draw 150 feet.



State Highway Bridge, Saybrook, Conn.
Total length of Roller Lift Draw 213 feet.

Government Jetties at mouth of Connecticut River.



West Jetty Showing Lighthouse, mouth of Connecticut River.

Mr. J. R. Andrews, New Britain, President Business Men's Association.

Hon. E. Hart Fenn, Wethersfield.

Major G. B. Pillsbury, New London, Corps of Engineers, U. S. A.

Mr. C. T. Shean, Springfield, Board of Trade.

Mr. Herman Burgi, Springfield, Springfield Gas Light Co.

Mr. W. S. McNary, Boston, Chairman Connecticut Valley Waterway Board.

Mr. C. P. Chase, Springfield, Connecticut Valley Waterway Board.

Mr. J. J. O'Donnell, Holyoke, Connecticut Valley Waterway Board.

Mr. W. F. Williams, Boston, Chief Engineer Harbor and Land Commission.

Mr. Eben Jackson, Middletown, Twentieth Century Club.

Mr. G. Ellsworth Meech, Middletown, Harbor-Master.

Hon. F. B. Weeks, Middletown, Ex-Governor.

Mr. A. R. Crittenden, Middletown, Manufacturer.

Mr. E. R. Rogers, New London, President Business Men's Association.

Mr. J. Arthur Allen, New London, President State Business Men's Association.

Mr. Thos. A. Scott, New London, Harbor-Master.

Hon. B. F. Mahan, New London, Mayor.

Hon. Frank J. Rice, New Haven, Mayor.

Mr. E. E. Durant, New Haven, Manufacturer.

Mr. G. E. Verrill, New Haven, Engineer of War Department.

Mr. Geo. B. Kellar, New Haven, Harbor Commission.

Mr. Edw. Gagel, New Haven, Harbor Commission.

Mr. E. Harris Weaver, New Haven, Harbor Commission.

Mr. Fred C. Bushnell, New Haven, Harbor Commission.

Mr. Edw. P. Avery, New Haven, Harbor-Master.

Mr. Walter B. Furst, New Haven, Benedict-Manson Marine Co.

Hon. J. Q. Tilson, New Haven, Congressman.

Mr. C. H. Nichols, New Haven, Chamber of Commerce.

Mr. G. E. Osborne, New Haven Yacht Club.

Mr. Geo. Redmond, New Haven, Townsend Bros.

Mr. Myron Durham, New Haven, Warehouseman.

Mr. Geo. Burgess, New Haven.

Mr. Geo. Scranton, New Haven, Manufacturer.

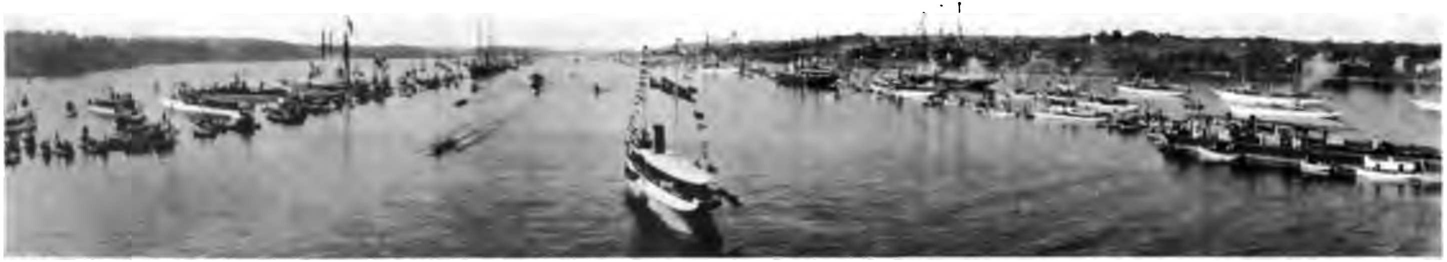
Mr. Wm. S. Pardee, New Haven, Commodore New Haven Yacht Club.

Mr. Garry Paddock, Bridgeport, Harbor-Master.

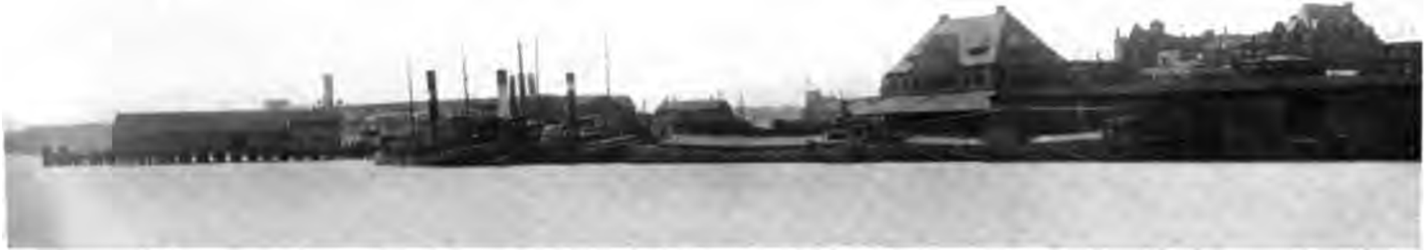
Capt. Ed. B. Palmer, South Norwalk, Harbor-Master.

RIVERS AND HARBORS.

Connecticut was treated by the hand of nature in a most bounteous manner so far as her rivers and harbors are concerned. A glance at the map indicates the manner in which the state is subdivided by these rivers of importance and with a direct coast line of approximately 116 miles on Long Island and Fishers Island Sounds, indented by numerous harbors, among them being one of the finest on the Atlantic seaboard. Considering this, it is apparent that the state is well situated to enter into the coastwise trade to a greater degree than at present and to prepare to share in the great increase that is bound to come in the next decade in water transportation, which is to be stimulated by the completion of the Panama Canal. There is no reason why Connecticut should not again take rank as a maritime state. In fact, the completion of this great canal which has attracted the attention of the world and which will be successfully carried to completion long before the stipulated time under the able direction of Lieut.-Col. George W. Goethals, its Chief Engineer, has a significance that Connecticut should study in the most careful manner. Economic changes are bound to be wrought from coast to coast and the northern Atlantic will ultimately be a legatee of the changed conditions; hence if Connecticut is ready and willing a new field for profitable investment awaits her. Possibilities of future industrial growth of the state through this new avenue of commerce is not at all remote. Consider the opportunities presented by the tremendous forests of Oregon, Washington and British Columbia, which are to be brought thousands of miles nearer than at present; consider that the transportation of lumber from British Columbia to Atlantic coast ports of the United States now costs about $14.00 a thousand feet by way of Cape Horn, and that it will undoubtedly be brought via the canal for about $8.00 per thousand. This will have its effect on the southern lumber market and it is quite likely that the output of those mills will be diverted to the interior of the country and to a large extent up the Mississippi Valley. This means that lumber may come from the Pacific to this vicinity for distribution inland. It can be brought in foreign bottoms from British Columbia, the run of the mill; sorted and dressed at a planing mill in a great distributing yard, shipped into eastern Canada, receiving a drawback upon the duty, or may be sent to all parts of New England plus duty. Again we find huge waterpowers on the Pacific coast close to tidewater. Already great pulp mills are being erected, the logs coming to the mill in flumes, here made into pulp, using the cheap electric power generated by the waterfalls close at hand. It is the purpose of these concerns to cut up the clear stock from the huge spruce trees into lumber, using the great gnarled knots and the culls for pulp wood. They can load steamers at their own wharves with lumber, stowing baled pulp where the lumber will not stow well, thus sending their product cheaply to this coast. Large mills for the manufacture of newspaper are sure to spring up at some tidewater point where railroad facilities are good, to take advantage of this new economic condition. This is more apparent when it is remembered that the manufactured product takes a far higher freight rate, therefore the short haul to the market from the mills at tidewater is sure to be a factor to be reckoned with. There will be many other changes to come that are little realized and it

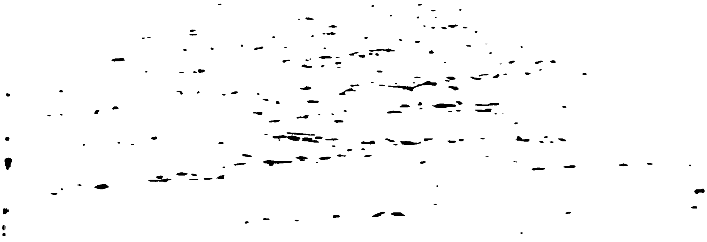


Upper New London Harbor during a Harvard-Yale Boat Race.



New London Waterfront opposite Railroad Station.

Power House, State Insane Asylum near Norwich on Thames River.



Norwich Harbor, Thames River.

is with hope for Connecticut's future that we at least feebly try to have the people look to the development of its transportation facilities.

We append herewith a table showing the rivers and harbors of the state under improvement by the Federal Government, also giving the draft at mean low water and that available at high tide.

Table of the navigable depths of water in the various rivers and harbors in Connecticut, together with the mean rise and fall of tide.

Locality	Draft	Rise of Tide
Pawcatuck river	8 ft.	2.6 ft.
New London Harbor	23 ft.	2.6 ft.
Thames river	20 ft. to Allyn's Point 14 ft. to Norwich	2.6 ft.
Connecticut river below Hartford	10 ft.	3.4 ft. at mouth 1.2 ft. at Hartford
Eight Mile river	8 ft.	
Harbor of Refuge, Duck Island	20 ft.	3.8 ft.
Branford Harbor,	6.5 ft.	6 ft.
New Haven Harbor	20 ft. main channel 12 ft. Mill river 12 ft. Quinnipiac river 7 ft. West river	6 ft.
Milford Harbor	9 ft. to Merwin's Wharf 6 ft. to Town Dock	6.2 ft.
Housatonic river	7 ft.	6.3 ft. at mouth 4.2 ft. at Derby
Bridgeport Harbor	22 ft. lower main channel 18 ft. upper main channel 18 ft. Pequonnock river 12 ft. Yellow Mill channel 9 ft. Johnson's river 12 ft. Cedar Creek 7 ft. Burr Creek	6.5 ft.
Norwalk Harbor	10 ft. to So. Norwalk 8 ft. to Norwalk 6 ft. to East Norwalk	7.1 ft.
Five Mile river	8 ft.	7.2 ft.
Stamford Harbor	7 ft. west branch 9 ft. east branch	7.4 ft.
Southport Harbor	4.5 ft.	6.6 ft.
Greenwich Harbor	9 ft.	7.5 ft.
Westport Harbor and Saugatuck river	6 ft. to Saugatuck 3.5 ft. to Westport	7 ft.

PAWCATUCK RIVER. (Rhode Island and Connecticut.)

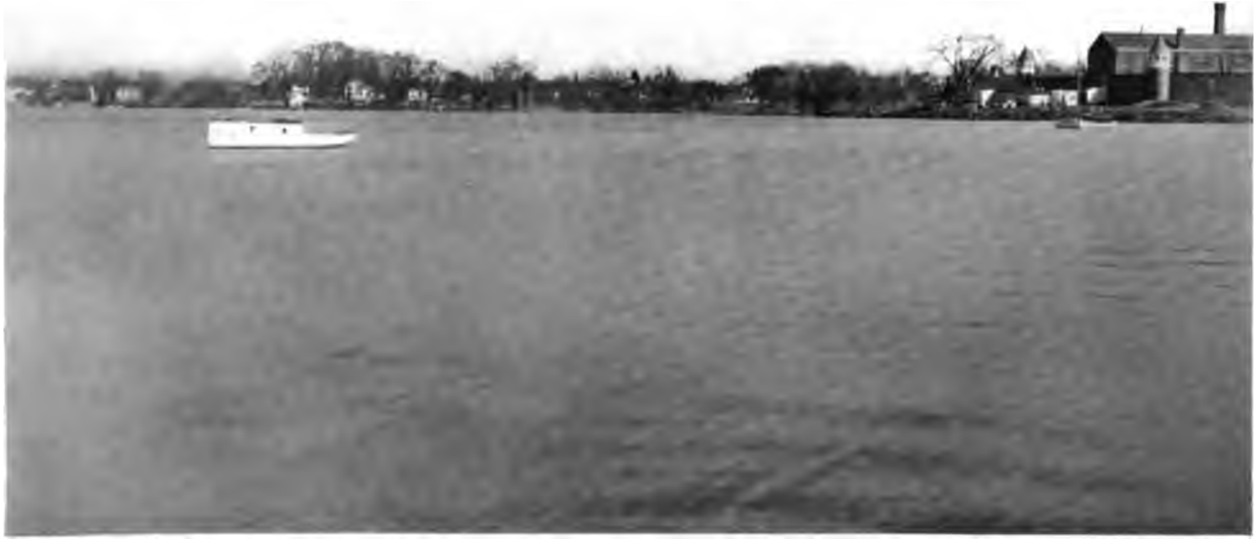
Is the state's most easterly river, forming a portion of the boundary between Connecticut and Rhode Island for 9 miles and is navigable to Westerly, R. I., a distance of 7½ miles from Stonington Harbor, the draft being 8 feet at mean low water. This river enters Little Narragansett Bay. Its commerce for the calendar year 1911 amounted to 53,921 tons, valued at $285,005.00. There is no Federal work of importance being done upon this river except that of yearly maintenance. Further improvements by removal of boulders and ledge rocks have been recommended by the Chief of Engineers of the War Department.

MYSTIC RIVER.

This river has received appropriations from the Federal Government of $40,100. Noank, West Mystic, Mystic and Old Mystic are located upon it. At Noank there is a thriving shipbuilding yard. There are also a number of other industries in the various towns. Coal, shipbuilding material and other articles are largely received by water. The last Rivers and Harbors bill appropriated $3,50C to redredge the channel. No report of the amount of commerce is available at this time.

THAMES RIVER.

This river is more a tidal estuary or arm of the sea. It is navigable to Norwich, Conn., fourteen miles from Long Island Sound, the draft being 14 feet, and 20 feet is obtained to Allyn's Point, about half way up. There is a railroad on both sides of the entire length, running close to the river. The nature of the bank is what may be termed fixed, hence there is little washing to be contended with. It is reported that the river has shoaled at a number of places, but otherwise is in good condition. A number of training walls should be raised several feet which would better navigation conditions. The river is well buoyed and lighted. The commerce for the last fiscal year amounted to 480,445 tons, valued at $7,063,796.39. There is a regular line of boats running from Norwich to New York, which is owned locally. This line stops at river points and New London and is understood to be quite successful. There is a regular summer service to Block Island from Norwich, operated by the New England Steamship Company. The Thames river has received excellent attention from the Federal Government. Norwich steamboat men and motor boat owners are anxious to have the old west channel opened again in order to avoid the long crossover from Allyn's Point to Stoddard's Wharf, they claiming that three-quarters of a mile would be saved each trip. It is stated that either end of this channel has shoaled and the rest has good water, hence the cost would be small as compared with the benefits that would accrue to shipping. The Harbor-Master at Norwich states that there were 576 trips of other than motor boats made on the river in July, 1912.



Wethersfield Cove, Connecticut River. State Prison at the extreme right. Picture taken during high water.

View Showing Beauties of the Lower Connecticut River.
Here for miles the river runs very deep.

View near Gildersleeve Island, Connecticut River.
A large amount of good land is destroyed here yearly.

In connection with this waterway we desire to call attention to the fact that the State Insane Hospital, at Brewster's Neck, a few miles below Norwich on the east side of the river, has a power-house located near the river with the railroad track between. This power-house furnishes the light, heat, etc., for the entire institution and consumes considerable coal in the course of a year, and inasmuch as the Insane Hospital at Middletown on the Connecticut river has its own coal-handling plant and receives coal under more adverse circumstances than would be the case at Norwich, yet at a large saving to the state, it would seem as if the question of water delivery at this institution would be a matter for consideration. There are a number of industrial plants that have sought the double advantage of water and rail delivery by locating on this river. The Thames River Specialties Company, which has located a large plant on the river at Montville, where they receive their coal and raw material by water, also have the advantage of rail shipment for their finished product. This company manufactures binders' and box board, and has recently doubled the capacity of the plant.

CONNECTICUT RIVER.

There is a great deal to be said about this river, mainly because is it the state's greatest stream and New England's longest river, receiving its name from the Indians as "Konnetikut," meaning long river. Today taking its place among the rivers of the nation, slowly but surely emerging from the forgotten to the lime-light of commercial activity, to receive a belated attention from the Federal authorities, the state, the municipalities, the manufacturers, the business man; that all may in future years have the benefits to accrue from a proper development of this great artery of commerce. This river, 360 miles long, flows through one of the fairest valleys known to mankind, teeming with inhabitants, endowed with industry and creative of invention, it has become a veritable workshop. Lined with magnificent cities, thriving towns and delightful villages, it invites the world to look upon it and compare its beauty, wealth, industries, agriculture and civic spirit collectively, and point out where there is a greater opportunity to bring to bear the present-day methods whereby requisite engineering skill shall devise a standard to strive for and then formulate the plan and carry it out.

Of its total length, but one-seventh is navigable. This does not compare favorably with any of the rivers of Europe, where for many years it has been the custom to develop the streams almost to their sources. The Rhine is a shining example of the combined effort of the states through which it flows. It has been made navigable for 535 miles to Basel, with a draft of 2 meters to Mannheim 354 miles, and is to be canalized from Basel to Lake Constance in Switzerland. A study of the methods pursued to attain the perfection in this magnificent highway of commerce and pleasure is a most interesting one, and to finally realize that there are employed in the commerce of this stream 13,000 boats, viz.:

Rhine Sea steamers, passenger boats, tug boats and barges, the latter being built mostly of steel and carrying from 1,500 to 3,000 tons on a draft, no greater than is now available in the Connecticut river, and to note that the tonnage of the Rhine is over 65,000,000 tons yearly, prompts us to applaud the intelligence of the German people in making this river so great. Another river that commands the attention of every student of waterway improvement is the Scotch Clyde. Not many years prior to the Fourth Act of Parliament in 1809, which gave the authority to deepen the river to 9 feet, there was available but 15 inches of water at Dunbarton bar. This improvement to 9-foot depth was the first great forward step, and in the 100 years succeeding the Clyde Trustees have deepened the river to 33 feet from the sea to Glasgow, at the head of navigation, a distance of 50 miles, which is the same distance as to Hartford, the present head of navigation on the Connecticut river. At the present time the Clyde Trustees have ordered a further deepening and widening of the channel so that the "Aquitania," one of the world's greatest ships, which is being built in a Glasgow shipyard, may reach the sea. Glasgow had a population as an inland city in 1809 of about 100,000, and after making the city a seaport it began to grow rapidly until it had a population of 872,021 in 1907.

Both the Rhine and Clyde are splendid examples of what can be accomplished by careful consideration, excellent judgment and unity of purpose, therefore should be used as an example for the future development of the Connecticut. It would be to the everlasting benefit to the people of this state and of the states of Massachusetts, New Hampshire and Vermont if provision was made for the study of these rivers by a joint commission, which should be, after making a report, constituted as we might say, a quadruple alliance, to carry out an ambitious and even pretentious development of the Connecticut river in conjunction with the Federal Government. The Commission should devise a plan of improvement upon broad and comprehensive lines to embrace navigation, protection of banks, disposal of sewage, development of water powers, reforestation of denuded lands and the building of storage reservoirs.

In connection with the improvement of the river along such lines, we quote below from the final report of the "National Waterways Commission."

FINAL REPORT NATIONAL WATERWAYS COMMISSION.

Conclusion 2. (In part.) "The time has already come, especially in the more thickly settled river valleys, when a stream must be considered with a view both to minimizing its harmful influences and to securing the maximum benefit from all its uses."

Conclusion 4. "The Federal Government has no constitutional authority to engage in works intended primarily for flood prevention or power development. Its activities are limited to the control and promotion of navigation and works incident thereto. The Commission is of the opinion that flood prevention is primarily a local problem, and the work of controlling floods should in the first instance be undertaken by the minor political subdivisions, but that the Federal Government may very properly participate with the localities in carrying out such works on navigable streams, where a substantial and necessary improvement to navigation will result. Unless some such policy as this is adopted and adhered to, there is grave danger that the Federal Government may go outside its proper jurisdiction and become involved in enormous expenditures which are for local benefit. It has sometimes been urged that the Federal Government should undertake works for flood prevention on non-navigable streams which happen to cross a state boundary line. It is clear that in such a case, if navigation is not concerned, the Federal Government should have nothing to do with flood prevention. A method is provided in the Constitution by which the states may cooperate for this purpose."

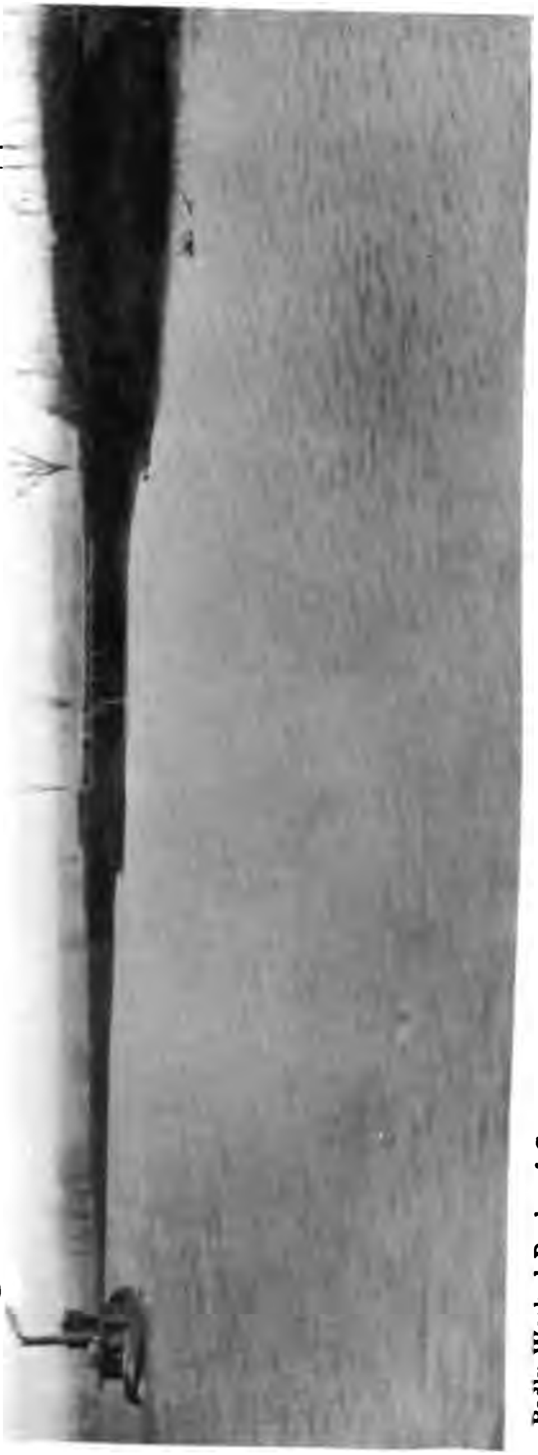
Already the Federal Government has begun the purchase of lands in the Connecticut Valley drainage area, authorized by the Appalachian-White Mountain Forest Reserve bill which passed Congress since our last report. The land acquired is in northern New Hampshire and cost $4.00 per acre. This with further purchase, will in time be of benefit to that part of the river traversing Connecticut.

The river within the state is divided into four distinct sections, the first commencing at the mouth and running to Deep River 11.3 miles by channel and 9.3 miles air line; most of this part of the river runs through low, marshy land, with here and there an outcrop of rock. There are few abrupt changes in the contour, thus the banks wash little and the channel holds very well. About 10% of the dredging is done in this section. The next section from Deep River to just below Middletown has a channel from 20 to 40 feet deep, and runs through high hills with rocky shores, making the most picturesque scenery upon the river. These hills rise to a height of about 600 feet within sight of the river. This section is 18 miles by channel and 15.5 miles by air line. There is no difficulty in holding the channel in this stretch. The third section from Middletown to Hartford, for the most part is very crooked, meandering through banks of alluvial soil and a subsoil of sand and clay, which is very susceptible to swash. The distance from the head of the narrows just below Middletown to Hartford by channel is 22.6 miles and by air line 14.7 miles, which gives an excellent idea of the river's eccentricities. Here the banks overflow during most freshets and are for the most part less than 20 feet, averaging perhaps 10 feet, which causes the broad meadows on either side to flood to a considerable depth, as freshets of 20 feet or more come almost yearly. The amount of dredging in this section is about 75% of the total for the river's navigable length of 51.9 miles. The fourth section runs from Hartford to the Massachusetts boundary, and except for two or three turns is very nearly straight. This section is not under improvement and is about 23 miles long. From Hartford to Windsor Locks the banks are of the same general nature as between Hartford and Middletown, and from Windsor Locks to the state line the river runs principally through a red sandstone shale formation, therefore has banks that wash little.

In accordance with House Document No. 1294, 61st Congress, 3rd Session, adopted February 27, 1911, an improvement of the river has been under way the past season to increase the channel depth to Hartford to 12 feet at mean low water, and up to June 30, 1912, only 3% of the project had been completed. The first portion of this work put under contract was for the deepening of the channel across the bar at the mouth of the river to 15 feet at mean low water, and increasing the width from 200 to 300 feet. This contract has now been completed by the Taylor Dredging Company. A new channel has been dredged to full project width at Dividend bar just below Rocky Hill, but has been little used, it being stated that it was impossible to make the turns with tows. There seems to be a variance of opinion in regard to this. At this point in particular many stakes with small bits of white cloth were left in the river by the dredging contractors. These stakes are often covered by high water and by flood tide, which makes them a menace to small boat navigation. It should be necessary for those responsible for erecting them to remove them in all cases immediately the work is completed.

In August, 1912, bids were asked for a large amount of jetty and reveting work at Sears' Shoals, Glastonbury, Press Barn and Clay Banks bars. About 80,000 tons of stone were involved and there was but one bidder, who bid only on Sears' Shoals and Glastonbury, and at such a high price that the bid was rejected. It was not possible at the time to purchase stone suitable for the work or under favorable conditions upon the river, inasmuch as the only available supply had been apparently contracted for by an out-of-the-state firm of breakwater builders. After considerable activity of those interested in having the river improved, the alleged contract was annulled, and late in the season a contract for the Sears' Shoals improvement was awarded to E. S. Belden & Sons of Hartford. The balance of the work will, it is hoped, be carried out next season and this Commission will renew its efforts to have the work rushed with all possible speed. The Commission requested the removal of a sunken barge by the War Department. This barge was on the East Hartford shore about two-thirds of a mile below the highway bridge. At eight feet on the gauge above mean low water the barge was entirely submerged, and during all of April was a menace to small boat navigation. The War Department promptly advertised for bids and the barge was wholly removed.

The Commission held a hearing of small boat owners and others interested in navigation concerning the establishment of more aids to navigation from Hartford to the Sound. A request was made of the Lighthouse Service, Department of Commerce and Labor, for bettering the conditions. The Department sent an official to Hartford to confer



Badly Washed Banks of Connecticut River at Glastonbury. Swash of passing craft creates damage even at low water periods.

Rock Banks, Connecticut River. No damage done here by erosion.

Another View of Rocky Banks of Connecticut River.

with the Commission. After looking over conditions it was determined by the official that more aids should be established to facilitate the movement of the increasing traffic. The Department advises that they are studying the conditions and will report soon what will be done. During the year they have rebuilt the Chester Light with a concrete substructure and iron superstructure, surmounted with a light of increased intensity.

In the Federal Rivers and Harbors bill approved July 25, 1912, page 67, there was inserted a provision for a survey of Wethersfield Cove, Connecticut river, the object being to obtain if possible a better entrance channel.

This amendment was added to the bill by request of this Commission through the courtesy of Senator Brandegee. The purpose of the survey is to provide for deepening and widening the channel which enters this cove. The channel is about 500 feet long, crooked, and narrow. About 167 motor boats of various drafts up to 3½ feet now use the cove for anchorage. It is difficult at summer stage for the larger boats to enter on account of the outlet of the Franklin Avenue sewer, belonging to the City of Hartford, which passes under the inlet near its outer end. It is reported that a considerable number of larger boats would use the cove if the channel was deepened and widened.

The Corps of Engineers, U. S. Army, have examined the inlet and cove in accordance with orders from the War Department and have reported that in their opinion the project does not warrant an expenditure by the Federal Government because there is now no commerce entering said cove.

It is not customary for the War Department to improve waters that are supposed to be of no commercial value; however, this Commission believes that if boats of a greater draft could enter the cove there is a likelihood of creating commerce, as the Connecticut State Prison is located on the westerly bank and abutts the deepest water in the cove, which runs from 9 to 23 feet deep. Here is an opportunity for the state to receive its coal direct at the prison as is done at the Connecticut Hospital for the Insane at Middletown, where a coal-handling plant has been established at a cost of $45,000. The consumption of coal at this institution is about 9,000 tons yearly, and it is reported by one of the trustees that a saving of 50 cents a ton has been made since the installation of the plant. By improving the entrance to the cove and constructing a coal-handling plant, which could be done for far less than at Middletown, a probable saving would accrue to the state on the coal for the prison.

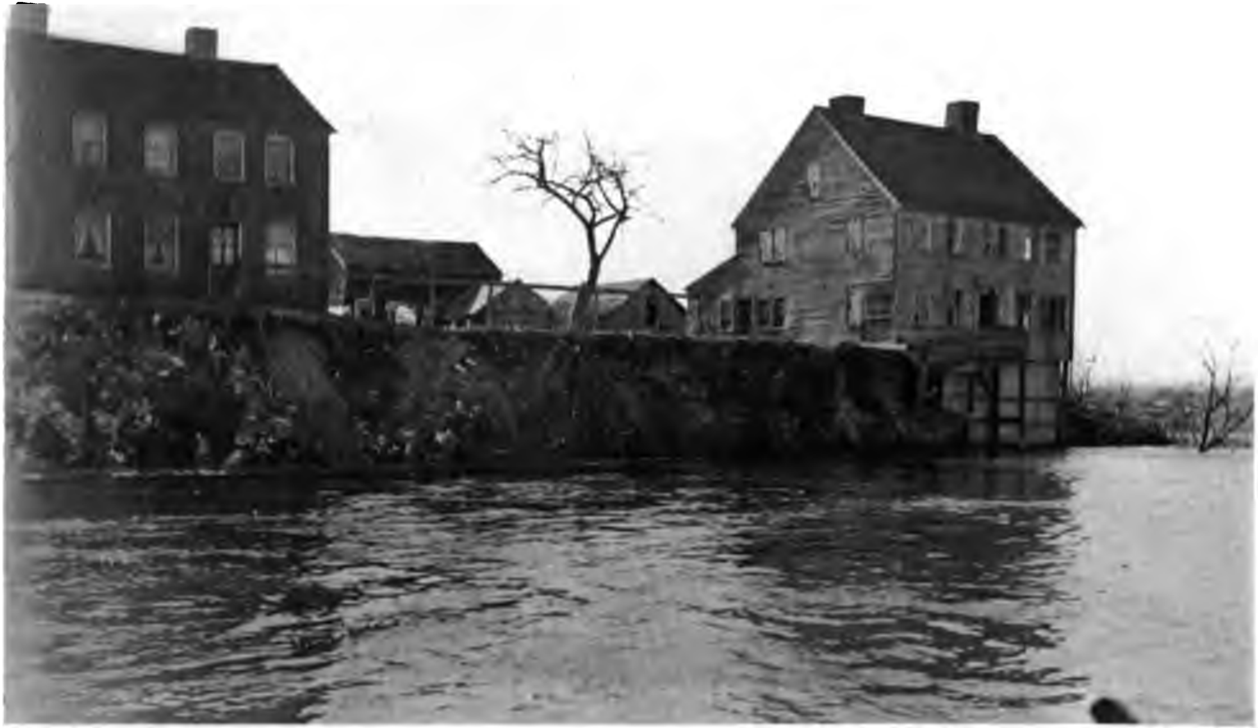
The Commission has asked for a review of the decision of the Corps of Engineers by the Board of Engineers at Washington. If the Federal Government will not improve the cove, this Commission believes that the state should undertake its improvement and that the sewer should be depressed. If this was done it is not unlikely that the Government would cooperate with the state.

EROSION.

As indicated, it may be assumed that the meadow-lands bordering the river are subjected to a maximum amount of damage. During freshets the swift current erodes the banks in many places, and even during the periods of mean low water the swash from steam and motor boats cuts away the banks. This is particularly true at Hockanum, Wethersfield, Glastonbury and Gildersleeve Island at Portland. In each case large areas of excellent meadow-land is being washed away annually. Never has the state paid serious attention to this condition or realized that all of the material washed from these unprotected banks goes into the channel below to thus impede navigation and make it more hazardous. Above Hartford the banks are also washing, and at a point directly above the Midland Division Bridge of the New York, New Haven and Hartford Railroad Company the river is eating into the east bank with great rapidity during freshets, and in the last few years has curved to the eastward to such an extent that it is probable that serious damage may be done and that the river may change its course. Owing to the long period of high water during the spring of 1912, the banks of the river became so thoroughly soaked that the damage done exceeded that of many years. Many river men state that they never remember a time when there was such a constant slumping of the banks through all the meadow section of the stream.

SURVEY.

At Wethersfield the Commission has caused a survey to be made of about 1,500 feet of river bank on the westerly side below the entrance to the cove. At this point there are five houses that are endangered by the encroachment of the river. They stand about 30 feet above mean low water, and during each successive flood the most northerly house is the point of attack. This house now overhangs the river at high water periods and is liable to collapse and fall in the stream during any future flood. There was at one time a road in front of this house, and the present occupant asserts that the house in which he was born stood east of this house and was washed away many years ago. If the northerly house, which belongs to the estate of Daniel Hurlburt, is destroyed, the next house will soon share the same fate. The Commission believes that the state should take immediate recognition of the erosion of all river banks and prepare to devise ways and means to save the destruction of property and to decrease the navigation hazard. We append a table showing the years in which floods have exceeded 20 feet in the Connecticut river since 1800. In addition to these floods, there is a flood or more yearly that goes above 10 feet. Every one of these floods damages the banks and by proper treatment, extending over a period of years, the erosion can be greatly minimized.



Precarious Position of House at Wethersfield, Conn., during a 21-foot Flood. Higher floods are not uncommon. Note rubbish dumped in front of second house.

Danger to Houses, Wethersfield, Conn., on Connecticut River during a Freshet.

HARTFORD.

Dates When Water in the Connecticut River has Reached an Elevation Greater Than 20 Feet, from 1801 to 1912 Inclusive.

Steamboat Records, U. S. Base.

Date	Elevation	Date	Elevation	Date	Elevation
Mar. 1801	27.50	Apr. 1867	20.00	Apr. 1887	22.50
Jan. 1839	24.20	Mar. 1868	21.50	May 1893	24.0
Jan. 1841	26.33	Apr. 1869	26.67	Apr. 1895	25.0
Jan. 1843	27.17	Oct. 1869	26.25	Mar. 1896	26.10
Apr. 1847	21.0	Feb. 1870	21.25	Apr. 1896	21.80
May 1850	20.75	Apr. 1870	25.33	June 1897	20.20
Apr. 1852	23.12	Apr. 1873	20.96	July 1897	20.40
Nov. 1853	20.50	Jan. 1874	23.87	Mar. 1898	20.60
May 1854	29.83	Apr. 1876	21.87	Apr. 1899	21.64
Aug. 1856	23.33	Mar. 1877	22.85	Feb. 1900	22.90
Mar. 1859	26.42	Dec. 1878	23.93	Apr. 1901	26.00
Apr. 1861	21.50	May 1879	21.42	Mar. 1902	25.50
Apr. 1862	28.67	Apr. 1883	20.50	Mar. 1903	23.40
Mar. 1865	24.75	Mar. 1884	21.50	Apr. 1905	23.90
Feb. 1866	20.50	May 1886	21.80	Apr. 1909	24.05
				Apr. 1912	21.02

The total Federal appropriation for the Connecticut river up to Hartford from 1836 to February, 1911, has amounted to $758,170, of this amount $406,076.46 was for permanent improvement and $352,093.54 for maintenance. Between Hartford and Holyoke a total of $121,213.44 has been expended, but this portion has not been under improvement since 1880. The largest appropriation for the river was granted February 27, 1911, Congress acceding to the combined requests of the commercial bodies from Hartford to the mouth, and the various waterway organizations, with the assistance of Messrs. Gildersleeve and Warner of this Commission. This amount was $177,000 on the continuing contract basis. Sixty thousand dollars ($60,000) of this amount is asked in the Rivers and Harbors bill, December Session, 1912, for use the coming season.

The commerce of the Connecticut river for the last four calendar years shows an excellent gain

1908	515,581 tons	1910	638,126 tons
1909	614,780 tons	1911	683,326 tons

and last year had a value of $23,537,837.81.

The commerce of Eight Mile river is actually a part of that of the Connecticut, however, it is considered as a separate item. It amounted to 1,479 short tons, valued at $21,526.07 in 1911, making an increase of 18% for the year. This river is little more than a cove opposite Essex on the lower Connecticut and has received one appropriation from the Federal Government of $9,000. It is known to navigators as Hamburg Cove.

There are many opportunities for the establishment of industries in proximity to the river, notably at Saybrook and Middletown, and more particularly at Hartford. The latter city has in its environs vast acreages of land that is now almost useless, inasmuch as it floods at certain river stages. Reclamation of the lands would add tremendous values to the city's tax lists and would provide a place for future industrial and commercial expansion where rail and water transportation would meet, that would offer unrivaled accommodations and which would make Hartford a strong competitor with other rapidly growing industrial centers.

It is amazing to study conditions on western and southern rivers and compare them with the Connecticut. We have prepared the following table, which is worthy of close scrutiny. It is safe to say that wonder comes to everyone's mind as to what is the matter with "Connecticut."

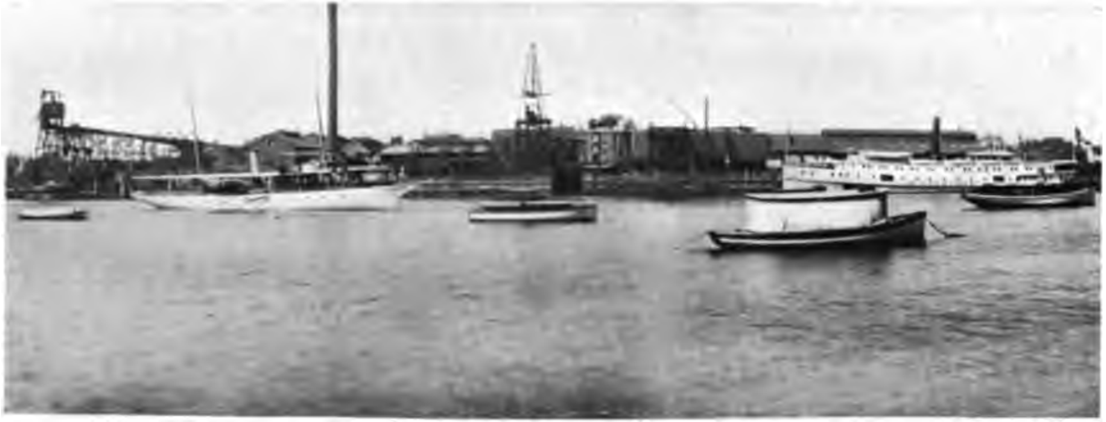
COMPARATIVE FIGURES SHOWING EXPENDITURE, VALUE COMMERCE, ETC., OF FOLLOWING RIVERS.

	* Missouri	** Tombigbee	Brazos	Connecticut
Miles navigable	2,284.8	680.5	424	51.9
First Government Project Adopted	1834	1870	1880	1836
Total Expenditure by Government	$15,451,432.07	$7,614,076.86	$1,676,878.39	†$799,010.90
Av. Expenditure per year	$208,803.13	$181,287.54	$52,402.45	$10,513.30
Av. yearly Expenditure per mile	$91.38	$272.21	$206.31	$202.18
Commerce Short tons, 1911	371,011	460,859	3,063	683,326
Value of Commerce, 1911	$1,082,515.23	$6,670,890.31	$759,678.00	$23,537,837.81
Av. value Commerce per mile	$473.75	$9,663.07	$1,791.69	$452,650.72
Av. value per ton per mile	$0.0013	$0.0209	$0.0585	$0.711
Av. Government Expenditure per ton	$0.563	$0.039	$17.11	$0.0148

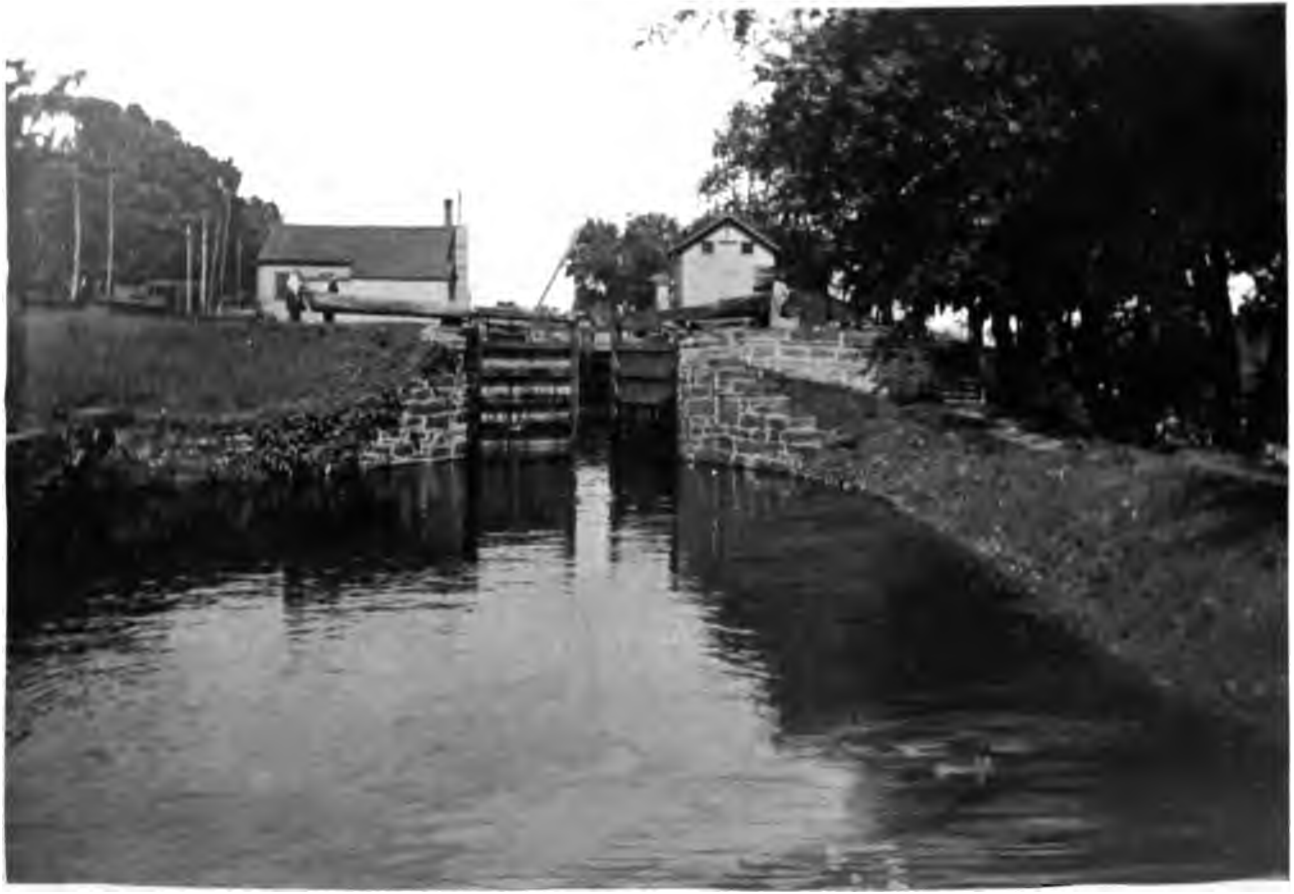
* The Government committed itself to the improvement of the Missouri with a 6-foot channel for 800 miles to Sioux City, Ia., at an estimated cost of $42,500,000, in the Rivers and Harbors bill approved July 25, 1912, and appropriated $800,000 to commence work.

** Includes Warrior and Black Warrior rivers, which are tributaries and are considered one river as far as commerce and improvement are concerned.

† Does not include amount above Hartford or projected work next season below.



Portion of Docks at Hartford.



Lower Lock, Windsor Locks Canal, Connecticut River. Built prior to 1829.

DAM AND RAPIDS.

s the proposed Windsor Locks power de-
e years a subject of a great controversy,
gislature and the courts.
ibly chartered the Connecticut River Com-
rights for the "purpose of improving the
ticut river," not only at Enfield Falls, but
a subsequent act of the legislature of the
privilege. In 1829 the present locks and
were completed and boats were allowed
the charge authorized in the charter being
g passing up through the locks and canal
age of the boat. Down stream the charge
y because during good water boats would
porters at Enfield, thus avoiding paying
y made the rate in competition with river
The present dam at Enfield did not in
the river, hence boats could pass unob-

ppeared in the valley and the water navi-
h in this particular stretch of the Con-
to this day. As transportation by water
necticut River Company continued to in-
he head of the rapids, until by an amend-
he dam finally stretched clear across the
ower end of the canal at Windsor Locks
quently the function of the Connecticut
n power company, caring for the now and
The size of the original locks, which are
feet deep over the mud-sills, still in use,
he insurmountable barrier to the proper
Hartford and Holyoke.
ment ceased to improve this stretch of
precluded the use of the more modern
nal, increased by power uses, was hard
t boats that could pass over the sills of the
have been people in the valley who have
so improved as to restore navigation to
ce, Massachusetts. Many attempts have
but the opposition has been paramount.
urvey of this portion of the river was
der the supervision of Brevet Major-
Engineers. His recommendations called
n river at a point below the now Con-
ain highway to eastern Connecticut from
e locks at convenient points and was to

follow the higher table-land, which borders the meadows all the way to a dam at King's Island and from there to Holyoke by open river navigation. The cost of the project was largely responsible for its defeat. In 1905 another complete survey was made by the War Department under the direction of Lieut.-Colonel W. T. Rossell, Major George W. Goethals and Major J. G. Warren, Corps of Engineers. This project recommended the establishment of dams to make slack-water navigation possible, the first dam to be erected below the present stone highway bridge at Hartford. The maps with triangulations, accompanying this report, are extremely valuable and will continue to be so. This project, like its predecessors, died because of cost.

Thus has the key to the whole situation, the Windsor Locks Canal, continued to block the growth of the valley and deny to 212,392 people (census of 1910) above Hartford, up to and including Holyoke, the benefits of water transportation.

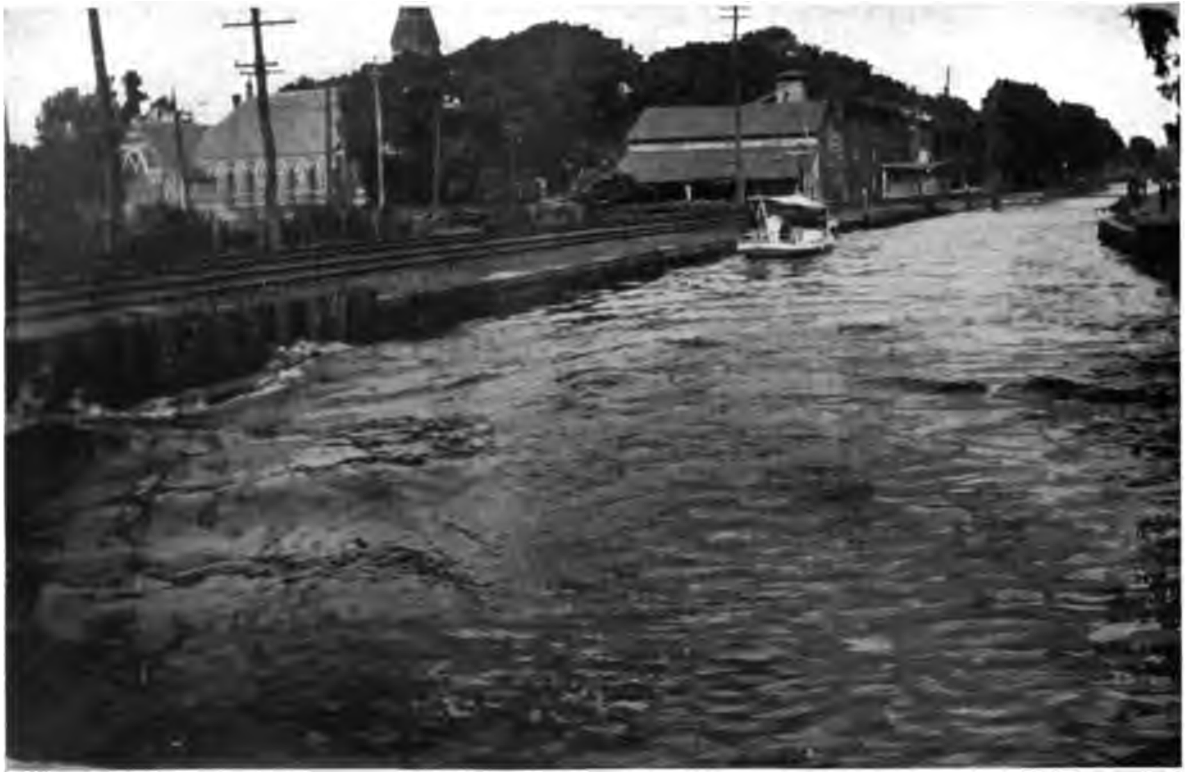
However, realizing the advantages to accrue from the development of an approximate maximum of 35,000 horse power and a minimum of 20,000 horse power, also that the Connecticut River Company only developed about 3,500 horse power of the grand total, and it being stated that this company would not sell its franchise granted by the State of Connecticut in 1824, it determined the Enfield Power Company to seek through Congress the Federal right to develop the unused power.

Their bill was introduced May 3, 1908. This bill provided for a dam at the foot of the Enfield Rapids (the present dam being at the head) which would take advantage of an additional fall of about 35 feet and create a pool extending up stream about 5½ miles; the proposed dam to have a lock in it, which would assure the greatly desired navigation to Massachusetts.

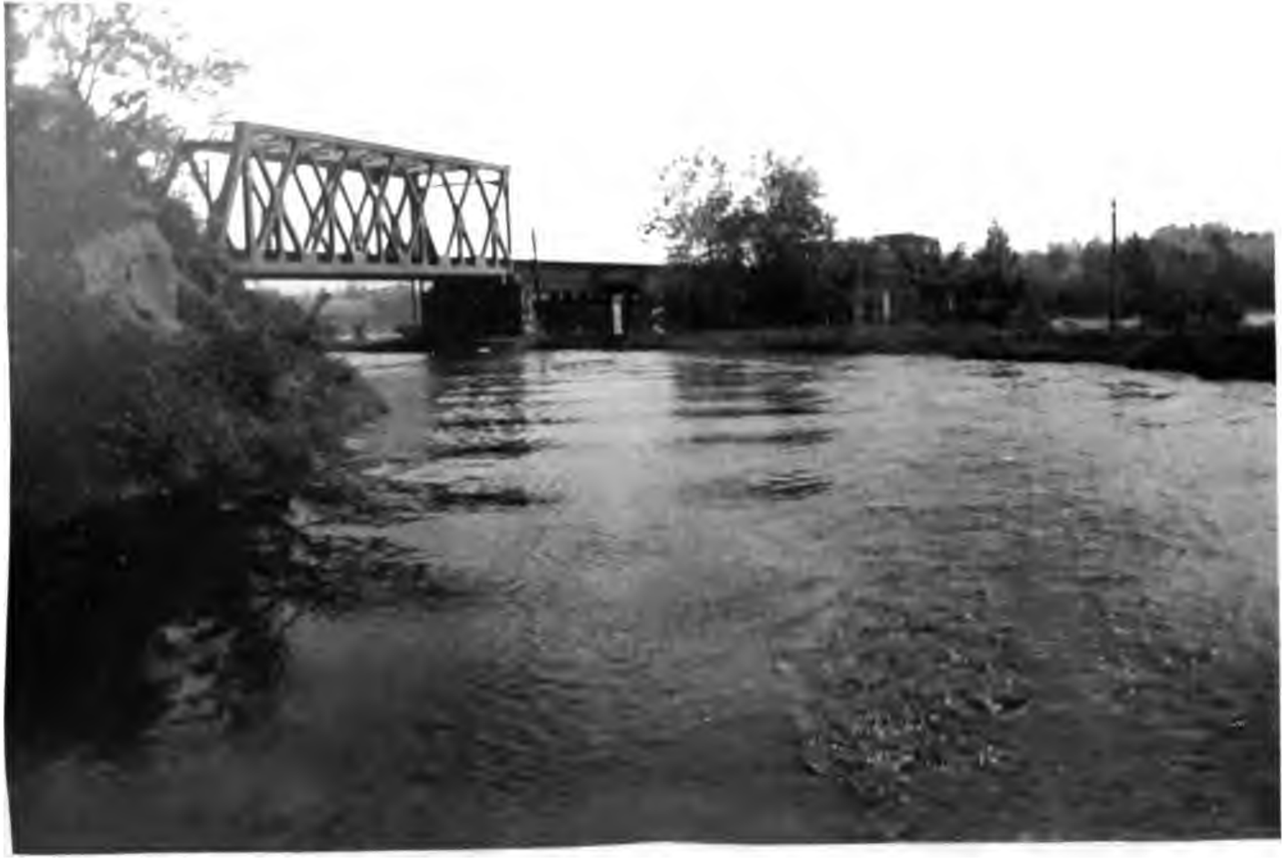
A little over a year later, another company known as the Northern Connecticut Power Company, holding a Connecticut charter, presented on June 25, 1909, a bill seeking the same rights as the Enfield Power Company and agreeing also to make navigation possible by providing a lock in their dam, which was also to be built at the foot of the rapids.

Spurred to activity by these bills, the Connecticut River Company introduced a bill to relocate their present dam, on July 9, 1909, but they did not agree to offer further facilities for navigation than those already afforded by their present locks and canal.

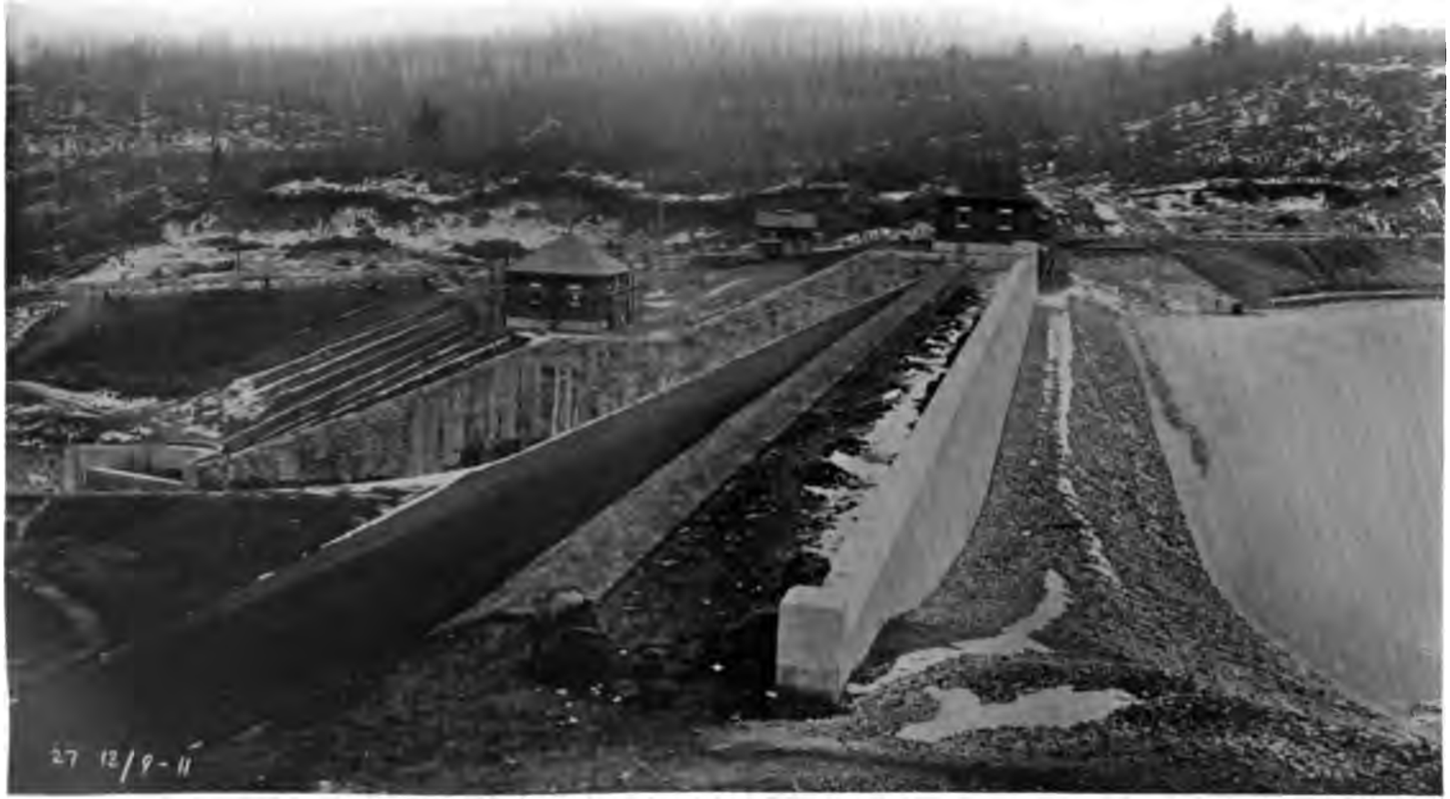
In the meantime a survey by the United States Army Engineers was authorized by Congress and ordered by the War Department, to determine if, in connection with the plans proposed, that navigation could be made possible from Hartford to Holyoke at a reasonable expenditure by the Federal Government. This survey was under the direction of Lieut.-Colonel Harry Taylor, Corps of Engineers, U. S. A. The same being concluded, a report was submitted to Congress, stating that if a dam or dams were built at Windsor Locks and a lock of adequate dimensions was built therein, that navigation could be extended to Holyoke, and recommended that the Government undertake the construction and main-



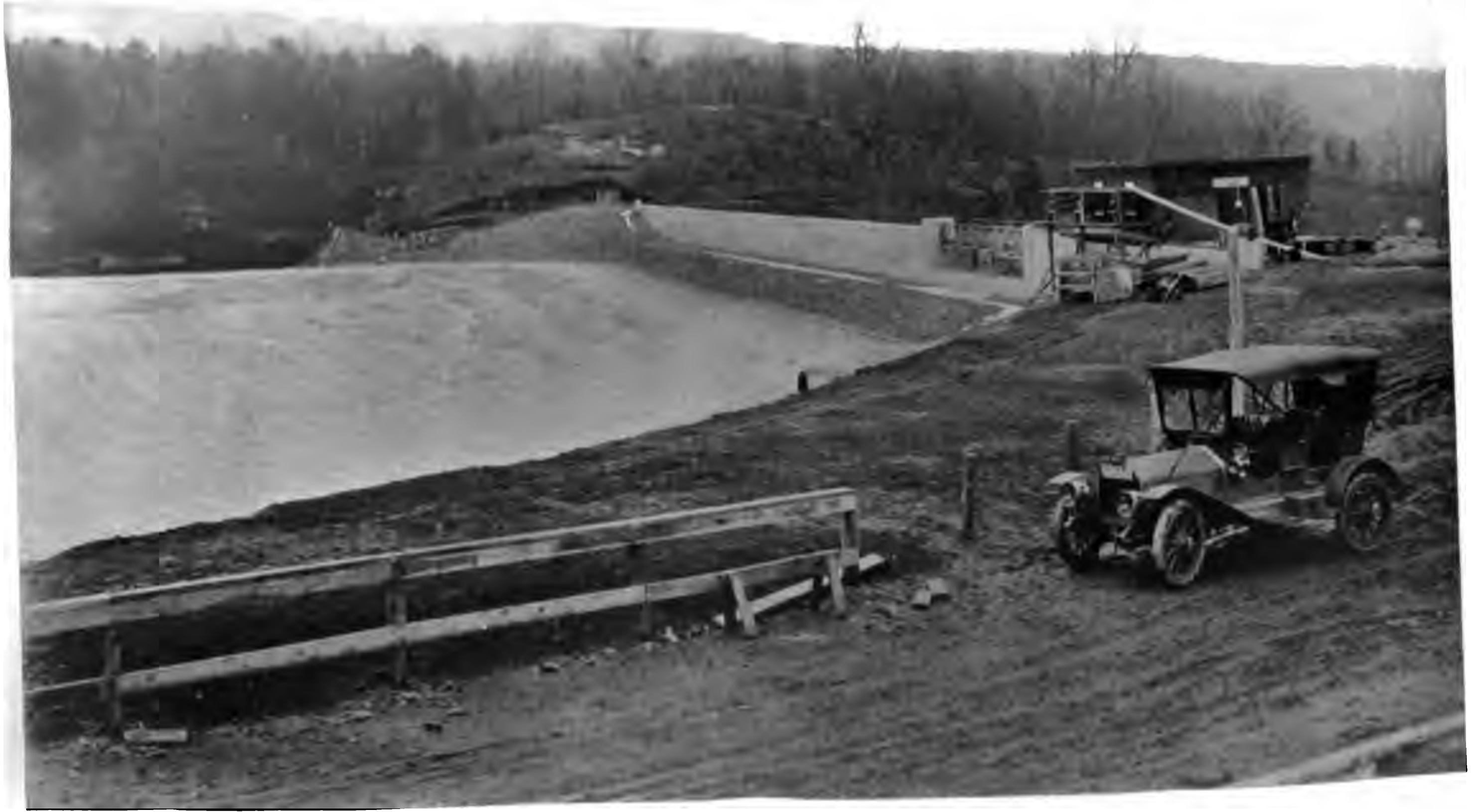
Windsor Locks Canal. Showing class of boat that can use the canal in its present condition.



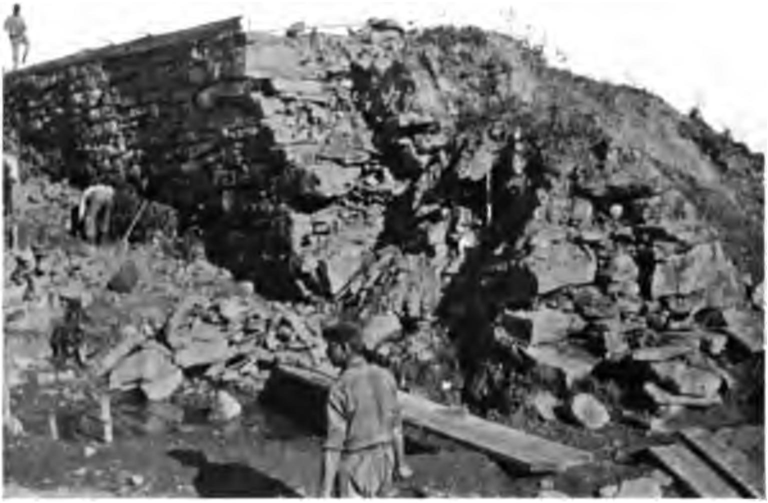
Railroad Bridge across Windsor Locks Canal and the Connecticut River.



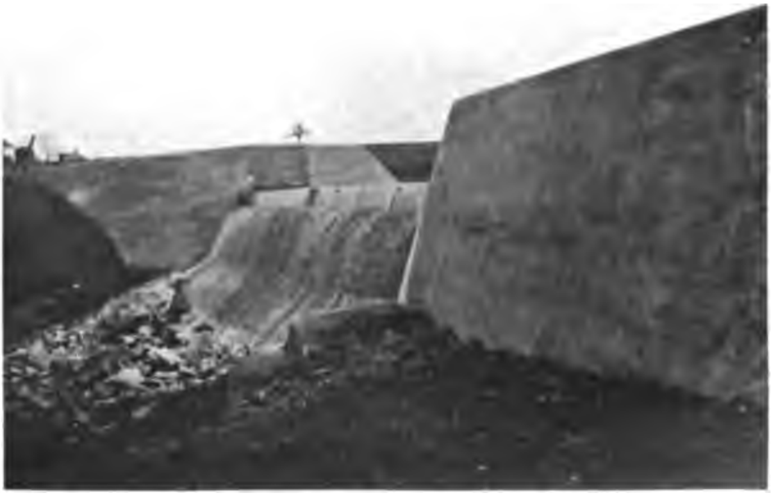
Whigville Dam, New Britain Water Supply, showing Core and Spillway Walls. Height of reservoir above city 391 feet.



View Whigville Reservoir, New Britain Water Supply, capacity 80,000,000 gallons. Showing Dam and Spillway.



Remains of Dam Destroyed by Flood near Middletown.



Dam erected to take place of destroyed Dam near Middletown.

Spillway Whigville Dam, New Britain Water Supply.

Portion of New Dam being erected across Farmington River near Collinsville.

tenance of a 7-foot channel from Hartford to Windsor Locks at an estimated cost of $1,015,600, provided:

"1. That a suitable lock and dam for surmounting Enfield Rapids be constructed by private or corporate interests, free of cost to the United States.

2. That navigation through said lock shall be free from any toll or charge.

3. That those constructing the lock and dam assume all responsibility for claims for damages that may arise from flowage rights, from injury to water power, or from any other source.

4. That after construction the lock shall become the property of the United States, and shall be maintained and operated at the expense of the Federal Government."

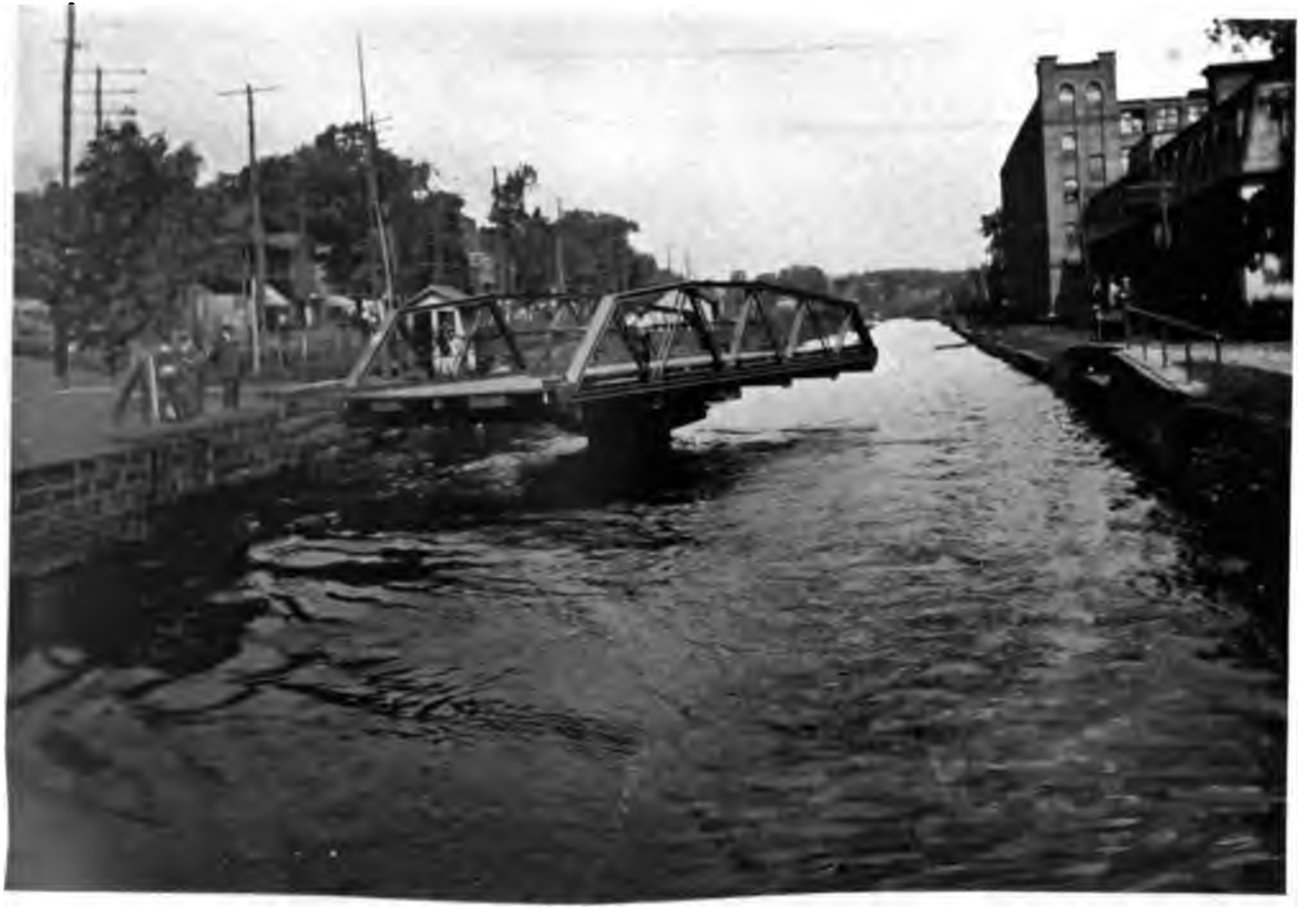
These provisions were agreed to by the Northern Connecticut Power Company, and the report of the Board of Engineers for 1912, submitted to Congress in December, again calls attention to the requirements of the Federal Government.

During the month of April, 1911, certain minority stockholders of the Connecticut River Company brought suit against that company for an accounting, thus further involving the situation.

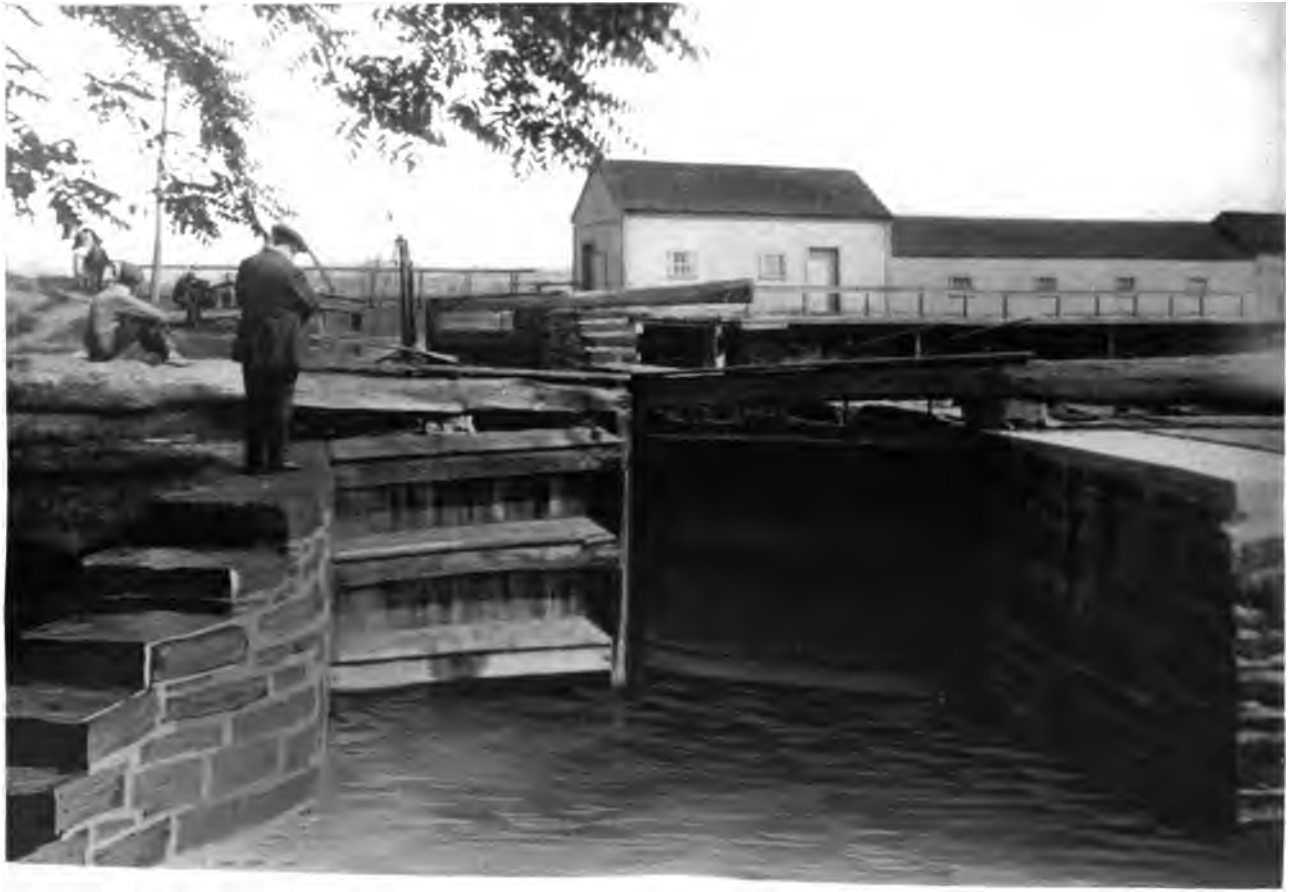
Then came the 1911 session of the Connecticut legislature, at which both the Northern Connecticut Power Company and the Connecticut River Company sought legislation, the former seeking the right from the state to dam the river and the latter seeking to further amend their charter (they having received important amendments in the session of 1909), to allow the issuance of bonds up to $5,000,000, etc.

In the legislature it was pointed out by some that it should not be the policy of the state to allow so large a bond issue upon the company's capital, which was $203,500. The opposition grew very strong and many amendments were offered in connection with the desired amendments of the Connecticut River Company. Among them was one to annul the right of the company to charge tolls as provided in their charter of 1824. This amendment was defeated, thus meeting the same fate as most of those offered, other than by the Connecticut River Company. Finally an amendment was introduced in the Senate to apparently provide for no tolls. It was passed with the other amendments sought, returned to the House of Representatives and accepted by them. The amendments upon reaching the Governor were vetoed, the one concerning tolls, because of the fact that it stated through "said river" failing to provide for the "locks and canal." The veto was sustained, hence no legislation was enacted in behalf of either company, the Northern Connecticut Power Company's bill having already failed to pass.

On February 6-7, 1912, a hearing was held on the bills of all companies desiring this important right, before a subcommittee of the Commerce Committee of the United States Senate at Washington. This Commission was represented by Chairman Warner and Commissioner Noone, both making statements before the committee concerning the state's



Highway Draw Bridge, Windsor Locks Canal. Showing small space for passage of boats.



Upper Lock, Windsor Locks Canal, Connecticut River.

cease to be charged upon completion of said dam or dams, which would make the time of such relinquishment of toll rights extremely problematical.

However, the fact that the legislature refused to act on the amendment and adjourned sine die, the following Tuesday, September 26, 1911, still leaves the right to charge tolls—a paramount objection.

FIFTH. If tolls, state or Federal, are tolerated at Windsor Locks, an insurmountable barrier will be raised which will permanently destroy the future possible commerce of this river, and deny to the towns and manufacturing communities in northern Connecticut and the cities of Springfield, Chicopee and Holyoke, in Massachusetts, all with a population of upwards of 200,000 people, the right of future navigation and cheaper freight rates, which will be a serious blow to the future development of this valley.

SIXTH. It is a well known fact that for 77 years no improvement has been made in the locks and canal now existent at Windsor Locks. It is also patent that the company now enjoying the privileges at this point was granted its charter for the purpose of "improving the boat navigation of the Connecticut river," and that the canal is and has been for many years used for the development of water power, thus creating a current which makes a small boat navigation which may seek passage through the canal hazardous, and cause tremendous delay and annoyance. The locks are inadequate, the canal is inadequate for present-day craft. It is not regarded as practicable to so improve the existing canal that it will ever be adequate.

SEVENTH. It is therefore the opinion of this Commission that the only feasible way of properly safeguarding future navigation is in accordance with those views set forth in Document 818, 61st Congress, 2nd Session, and we respectfully request that the following requirements be incorporated in any grant of the privilege of developing water power in said river:

(a) A dam built at Windsor Locks in accordance with the report to the Secretary of War by Lieut.-Colonel Harry Taylor.

(b) That the lock be built coincident with the dam.

(c) That the plan to be adhered to be for open river navigation up to said lock.

(d) That no tolls be charged by any company receiving Federal rights.

(e) That the Secretary of War have full discretion to regulate the flow of water in the interest of navigation.

(f) That Congress, as soon as practicable, grant the right to dam the river, fully protecting the rights of the people of Connecticut and the people of the United States of America, on the lines suggested, the work to be completed within a reasonable time thereafter.

(g) It is the special desire of this Commission that the Committee on Commerce of the United States Senate, or a subcommittee appointed by it, shall look over the situation in person. This Commission will extend every courtesy in its power to such committee whenever it can come to Hartford.

Subsequently the Commerce Committee of the United States Senate submitted to the companies a list of twelve questions, which were later answered by them. Those of the Northern Connecticut Power Company were understood to be satisfactory.

About that time came the terrible disaster to the Titanic, the investigation of which was intrusted to some of the members of the Commerce Committee of the Senate, thus materially delaying any action on the power bills then before the committee.

On June 21, 1912, the stockholders of the Connecticut River Company met and voted to relinquish their right to charge tolls forever, which now makes such traffic as can pass up stream toll free, and assures the people of the state that there will be none as a bar on any further improvements which may be made by this company.

In September hearings were held by the Connecticut Valley Waterway Board of Massachusetts at Springfield and Holyoke, at which this Commission was represented by Chairman Warner and Commissioner Cadwell. This board was created by the last General Court of Massachusetts to investigate the Connecticut river and report back in February, 1913, what, in their opinion should be done to provide navigation for the cities of Springfield, Chicopee, and Holyoke, and what other improvements might be made that would be of benefit. The representatives of the Connecticut Commission assured the Massachusetts Commission that they would do all in their power to assure future navigation. After these hearings the joint Commissions with many prominent men from Holyoke, Chicopee and Springfield, made a trip in a 65-foot yacht, drawing about 3 feet, from Springfield to Hartford. It was intended to go below Hartford, but the trip consumed nearly the entire day, the delay being mainly in the river below Windsor Locks. Several times the craft ran aground and finally at the mouth of the Farmington river came to a sudden stop on a shifting bar, which taxed the strength of the entire crew and guests to get the boat off, but added, however, to the knowledge of all concerning the neglected Connecticut river above Hartford.

On October 11, 1912, it was announced by the various power companies that an agreement had been entered into by and between the Connecticut River Company and the Northern Connecticut Power Company, the Enfield Power Company having withdrawn, whereby both companies agreed to sell out to Stone & Webster of Boston, Massachusetts, who are large developers of power projects in the United States. This settlement of the controversy regarding the right to develop the Windsor Locks power is contingent upon a satisfactory grant being secured from Congress to dam the river at King's Island.

Inasmuch as assurances have been repeatedly given at Washington, indicating that if the contending power companies would reach an agreement, Congress would then quickly grant the Federal right to dam the river at this point, therefore it is hoped that the bill will be passed during the 3rd Session of the 62nd Congress.

On November 22, 1912, this Commission and the Massachusetts Waterway Board held a joint meeting at the Hotel Kimball, Springfield, all of the Massachusetts Commission being present and all of this Commission except Mr. Chappell. The purpose of the conference was to agree upon the form that the part of the bill to be presented by the Connecticut River Company to Congress should be in, providing it was found to be unsatisfactory to navigation interests. Mr. H. B. Freeman, Jr., of Hartford, appeared for the power companies, and agreed to submit a bill within a week embodying the ideas of the joint Commissions. This was done, and the section four was agreed to be satisfactory and believed to be for the best interests of all concerned. (Section four has been changed to section three in S. Bill 8033.)

This section has been somewhat changed by the Board of Engineers, U. S. Army, but still provides the requisite protection to navigation. However, portions are not in accord with what this Commission believes for the best interest of the state. Further provision for controlling the flow is still delegated to the power company and not to the Secretary of War in accordance with the desire expressed before Commerce Committee, February last. Further objections will be entered. Since this report was prepared the Secretary of War has been vested with proper authority in S. Bill 8033, section two.

HOUSATONIC RIVER.

The state's second river in point of length, being 130 miles long and third in point of commerce.

This river is navigable to Derby and Shelton, a distance of twenty-two miles from Long Island Sound. It empties into the Sound at Stratford, a few miles east of Bridgeport, and offers an excellent opportunity for intercommunication between these places, as well as to New York. It has a draft at mean low water of 7 foot minimum and 11 foot maximum, and the value of its commerce for the calendar year of 1911 was $534,098.85, and 97,098 tons were transported. At Derby the Naugatuck river joins the Housatonic, and within a distance of 20 miles up this stream are the important manufacturing centers of Ansonia, Seymour, Beacon Falls, Naugatuck, Union City and Waterbury. In these places almost one-half of the rolled brass goods produced in the United States are manufactured.

There is an anchorage basin 12 to 18 feet deep, covering an area of about one mile long and one-eighth mile wide. The channel is well buoyed and lighted, and the river is protected by a jetty about one and one-eighth miles long.

By the use of the Housatonic river to its fullest degree, and with proper dockage facilities at Derby, freight could be brought from distant points by water and transhipped by rail to these places, thus giving the benefit of lower transportation rates, and when the Barge Canal is finished across New York State to the Great Lakes it will be quite possible to bring copper without breaking bulk from Michigan to Derby. It is safe to say that if the Naugatuck river was in Germany it would be put to a better use than what a cursory survey of its present condition indicates.

STONINGTON HARBOR.

This harbor is located in the extreme eastern part of the state and is little used today except for traffic bound up the Pawcatuck river. It has received in the past considerable attention from the Government and once was the terminus of an important line of steamers known as the Stonington line, which ran to New York. The harbor is now used as sort of a ship hospital for non-commissioned steamboats. It is the last harbor of refuge before reaching the open sea and is protected from gales by two breakwaters, and has an anchorage basin for vessels drawing up to 24 feet and an inner basin 12 feet.

NEW LONDON HARBOR.

This harbor is the state's finest, as well as New England's. There has been but $159,000 appropriated for improvement or maintenance upon it by the Federal Government, of which the last $12,000 was for Shaw's Cove. It ranges in depth from 26 feet to 77 feet at mean low water, the tide being but 2.5 feet. The amount of commerce for the last year totaled 841,113 tons, valued at $78,323,083.10. The tonnage increase for the year was 5%. The passenger traffic of this harbor is very important, there having been 901,778 people entering and leaving during the year. The Federal Government is now considering improving the harbor in connection with the work the state contemplates carrying out, and it is expected that the next Rivers and Harbors bill will carry the authorization for deepening to 35 or 40 feet. The terminal work authorized by the state through the legislative session 1911 is reported elsewhere.

BRANFORD HARBOR.

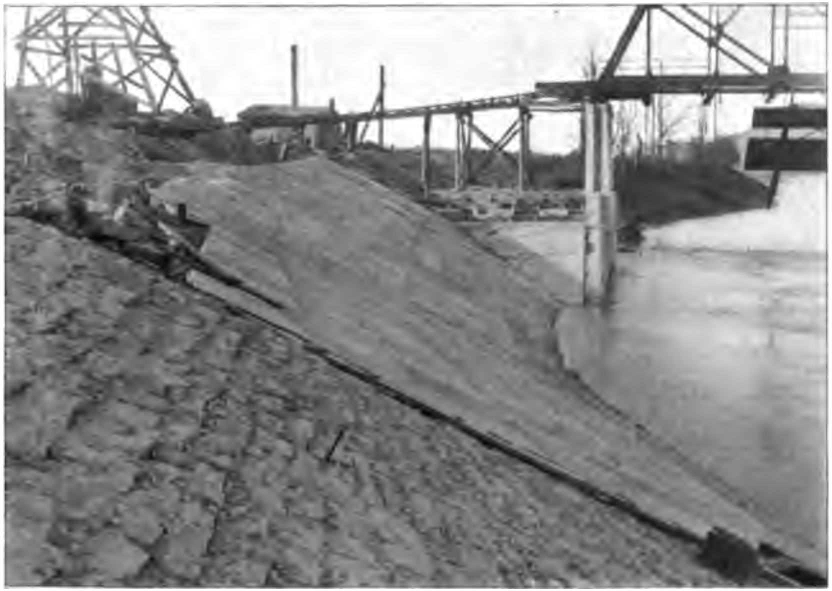
The total appropriations for this harbor amount to $18,000, and its expenditure has been of great benefit to the manufacturing concerns in the vicinity. During the last year the commerce amounted to 41,744 tons, there being considerable iron, coke and sand for the factories. The value of this commerce amounted to $237,899.08.

NEW HAVEN HARBOR.

Has the distinction of being the state's principal harbor, doing a business of almost double its nearest competitor. There are three breakwaters protecting the outer harbor and at the same time acting as a harbor of refuge. These breakwaters have cost the Federal Government $1,267,243.46 and are now completed to full project, length and height offering good protection for large boats from all directions except the southwest.

Manufacturing Plant on Thames River. Coal and Raw Material received by water. Finished product shipped by rail or water.

New Haven Harbor. Showing Industries which border it.



Reveting Consisting of Concrete Slabs, for shore protection at the Movable Dam at Rotterdam.

The total length of the three sections is 4,200 feet. It is reported that 6,112 vessels found shelter during the year. The city is situated at the head of the harbor, about four miles from the breakwaters. Here three rivers, the Quinnipiac, Mill and West enter the harbor. The former river has a navigable depth of 12 feet at mean low water, Mill river 12 feet, West river 7 feet, but is now to be improved to 12 feet. The harbor proper has a channel 20 feet deep and has ample anchorage basins. The city has recently established a new harbor line on the west shore, which will give an additional area for improvement. Both the east and west shores are susceptible to reclamation for large areas, and should such work be carried out it would furnish some of the finest manufacturing sites in the state, and undoubtedly would return to the City of New Haven many fold the expenditure required. So many concerns are seeking both water and rail locations in order to manufacture on a more economic basis that large industrial colonies would quite likely result in the not far future.

The commerce of New Haven Harbor amounted to 1,995,401 short tons the last calendar year, valued at $124,261,691.17. This is a fine showing and makes many western and southern projected waterway improvements appear at a disadvantage compared with the actual commerce in sight. The assistance of this Commission was sought by the New Haven Yacht Club concerning a breakwater at Morris Cove, and a hearing was subsequently held at the Hotel Taft, October 9, 1912, for those interested in and desiring a breakwater at Morris Cove, New Haven Harbor, to protect the pleasure craft, not only of local owners but of the transient, also for the protection of fishermen and of schooners, particularly from southwest gales. These blows usually come up suddenly and are severe. The Commission heard all who wished to speak upon the subject and was impressed with the fact that some protection is needed at this point. The following day an inspection was made of the proposed site for the breakwater, in company with Mayor Frank J. Rice and Messrs. George B. Kellar, Edward Gagel, E. Harris Weaver, Fred C. Bushnell and Edward P. Avery of the Harbor Commission, Mr. E. E. Durant, Congressman J. Q. Tilson, also Messrs. Walter B. Furst, C. H. Nichols, G. E. Osborne, George Redmond, Myron Durham, George Burgess, George Scranton and William S. Pardee.

The Commission has on file a petition from the New Haven Yacht Club and the Harbor Commission of New Haven, asking for the establishment of such a breakwater; however, under the present act it is not possible for the Commission to render other than a superficial service.

MILFORD HARBOR.

This harbor had a commerce the last calendar year of 34,350 short tons, valued at $634,870. The tonnage increase was 53.8% over the previous year. The harbor is used as a refuge for oyster boats, and a large number of pleasure craft seek it during the summer season. There is a 9-foot channel to Merwin's Wharf and a 6-foot channel up to the town dock, at mean low water, there being a tide of 6.2 feet. The anchorage basin is not deemed sufficient for present shipping conditions.

BRIDGEPORT HARBOR.

Is second in importance in the state. Black Rock Harbor, two and one-fourth miles to the west, is now considered a part of the harbor proper. This is due in part to the rapid industrial expansion of the city in the vicinity and the desire for better navigation facilities, also to simplify the work of the Government engineers. Bridgeport now has a harbor which it is thought will be ample for years to come. The main channel is 22 feet deep and 300 feet wide, and from the inner light 18 feet deep at mean low water, the tide in this harbor being 6.2 feet. There are five excellent anchorage basins ranging in depth from 12 to 22 feet. The largest is opposite the inside breakwater and has an area of 1,280,000 square feet. In addition to the harbor the Pequonnock river is navigable for nearly a mile on an 18-foot draft, thence 750 feet on 12-foot draft. Yellow Mill Channel is about 1 mile long, 12 feet deep, Johnson's river 1¼ miles long, 9 feet deep, Cedar Creek 2½ miles long, 12 feet deep and Burr Creek one-half mile long, 9 feet deep. There is a movement on foot to get a 15-foot channel in Cedar Creek and Johnson's river. A new bulkhead line has been established and in time will be filled in behind it. This will give a large amount of valuable land on the northerly side of the harbor. The commerce of this important harbor for the last calendar year amounted to 1,007,147 tons, valued at $78,323,083.10.

NORWALK HARBOR.

South Norwalk coming under the same head and being considered as one. The present draft to Norwalk is 8 feet and to South Norwalk 10 feet at mean low water, with a tide of 7.1 feet. The combined commerce for the last calendar year was 206,248 tons, valued at $1,958,275.26. The government has appropriated for improvement of this harbor $203,422.08 to date. There are in this vicinity a number of islands which also make a delightful place for pleasure cruising, which is extensively indulged in.

STAMFORD HARBOR.

Is composed of two parts, the easterly being known as "The Canal" and the westerly branch as Mill river. The combined commerce of the port was 260,469 tons for the last calendar year, valued at $12,737,399.36. Stamford is favorably situated for trade with New York and has two lines of boats running to that city. It is two miles from the lighthouse to the head of navigation and the depths available at mean low water are 9 feet in the east branch and 7 feet in the west, with a tide of 7.4 feet.

OTHER HARBORS.

There are Five Mile River Harbor, Southport Harbor, Westport Harbor and Saugatuck River and Greenwich Harbor. The latter is the most westerly harbor in the state and is within two miles on New York State line. Commerce for the last calendar year amounted to 101,500 tons, valued at $9,323,250. There is a freight line from this port to New York.

DUCK ISLAND HARBOR OF REFUGE.

This harbor is near Westbrook and is considered by seafaring men as the only refuge between New Haven and New London. Here the Government has constructed breakwaters, one running northerly from Duck Island 1,040 feet, which has been practically finished. The Kelsey Point breakwater has been completed for about 1,660 feet and the added protection has largely increased the use of this harbor. During the last year 341 more vessels afforded themselves the protection than the previous year, making a total of all classes of 1,121. The total appropriations for this much appreciated work now amount to $331,211.08. This harbor being a refuge for all craft, should not be considered as an expenditure wholly chargeable to Connecticut Waterways by the Federal authorities.

TOTAL APPROPRIATIONS OF FEDERAL GOVERNMENT FOR STATE; ALSO COMMERCE AND VALUE CALENDAR YEAR 1911.

	Appropriations	Commerce Short tons	Value
Pawcatuck river *a*	$191,130.67	53,921	$ 285,005.00
New London Harbor	159,000.00	841,113	78,323,083.10
Thames river	540,104.54	480,445	7,063,796.39
Conn. river, Hartford to Holyoke	155,000.00	*b*	
Conn. river below Hartford	799,010.90	683,326	23,537,837.81
Eight Mile river	9,000.00	1,479	21,526.07
Duck Island Harbor of Refuge *d*	331,211.08		
Stonington Harbor	337,453.83	*c*	*c*
Branford Harbor	18,000.00	41,744	237,899.08
New Haven Harbor *e*	837,194.35	1,995,401	124,261,691.17
New Haven Harbor Breakwater *d*	1,267,243.46		
Milford Harbor	74,100.00	34,350	634,870.00
Housatonic river	308,501.12	97,098	534,098.85
Bridgeport Harbor	1,047,577.26	1,007,147	42,043,640.99
Norwalk Harbor	203,422.08	206,248	1,958,275.76
Five Mile River Harbor	46,895.55	12,278	124,718.50
Stamford Harbor	180,680.98	260,469	12,737,399.36
Southport Harbor	67,435.74	5,368	25,500.00
Greenwich Harbor	24,836.79	101,500	9,323,250.00
Westport Harbor and Saugatuck river	35,341.12	14,011	56,076.87
Mystic river	40,100.00	*f*	*f*
Totals,	$6,673,239.47	5,835,898	$301,168,668.95

a Partly in Rhode Island.
b No commerce.
c Not reported.
d Benefits all shipping passing through Long Island Sound.
e Includes Mill, West and Quinnipiac rivers.
f No estimates available for calendar year 1911.

MUNICIPAL DOCKS.

Connecticut cities as a rule lack public terminal facilities, and as the improvement of all rivers and harbors is being made more and more contingent upon the same by the Federal Government, it is a matter that should have the serious attention of every community located upon navigable waters.

Norwich has a municipal dock, 20x40 feet, located up the Shetucket river. To reach this dock it is necessary to pass under the fixed Laurel Hill bridge. As the bridge is not high enough nor the basin big enough, it is impossible for a boat of any size to reach the dock. It has no storehouse, hoisting apparatus or rail connection.

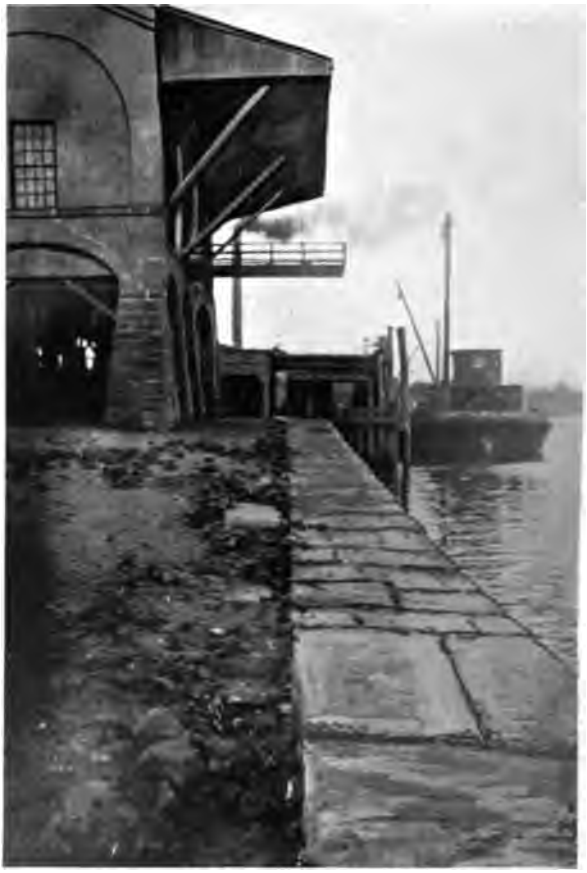
New London has no public dock where commercial craft can land. The city owns a small frontage opposite the railroad station, which is used for pleasure boats, but is inadequate even for that use.

Middletown has a street end which is the city's sole ownership on the Connecticut river front, and it has not been developed for a public dock.

Hartford has established in conformity to the legislative act of 1909 a public dock. This act granted the city the right to build, own or lease public docks, etc., and gave the city the right of condemnation for a period of ten years. The city has leased a piece of land containing 4.3 acres at the foot of Charter Oak Avenue and at the confluence of the Park and Connecticut rivers. Upon the Connecticut river there is a two-level concrete and spile dock about 100 feet long. In conjunction is a brick warehouse containing about 7,500 square feet of floor space. There is no rail connection, however, the railroad bounds the west line of the dock property. This warehouse is built at an elevation above all floods. Since the establishment of this dock there has been an increase in business each year. During the open season of 1912 there have been arrivals from Jacksonville, Fla., Portsmouth, Va., Halifax, N. S., St. John, N. B., and from other nearby ports. The cargoes unloaded have consisted principally of lumber fireproofing and plaster. Conditions have been bettered by the establishment of the docks, and it is expected that a substantial increase of business will be noted from year to year.

New Haven has a municipal dock at the foot of Water Street which is about 375 feet long and has a considerable opportunity for expansion. There is no warehouse nor rail connection with the dock. Lumber fireproofing, brick, etc., are the principal cargoes received. New Haven is alive to the subject of creating better facilities, and in a recent report Mr. Frederick L. Ford, the City Engineer says, "The capacity of the

Hartford Harbor from Municipal Dock.



Municipal Dock and Warehouse, Hartford, Conn.

municipal dock could be increased by about 200%. In question with such future extension, the question of providing extra storage space, storage or transfer sheds and hoisting cranes or mechanical equipment for quickly and economically handling cargoes should be thoroughly and exhaustively considered." Rail connection is also being thought of, and as Mr. Ford has the advantage of knowing how foreign cities equip their docks, having made a personal study and inspection of Europe's greatest ports, it will undoubtedly be New Haven's privilege to have an up-to-date dock at no distant date.

Bridgeport, the state's second city, has but 57 feet of publicly owned water-front, which is entirely too small to be of any avail. With the excellent harbor, fine anchorage basins, and with a rapidly growing manufacturing city within 55 miles of New York, it would be of great commercial benefit if the city had an ample, well-equipped municipal dock. There are several excellent locations available, and the city is vested with the right of condemnation if it is necessary to exercise it. Mr. Garry Paddock, the Harbor-Master, thinks that the city should have a dock at an early date, and hopes to have a piece of property owned by the city on Pequonnock river improved, which is 112x160 feet. It is already docked, but there is no channel to it at present. It is also hoped to have track facilities and hoisting apparatus on this dock, but it will probably be for city uses only.

Milford has a town dock which is in poor condition. There are no rail or warehouse facilities and no dock charges.

Stratford has a dock owned by John Bond, 80x100 feet, which is open to the public on nominal charges. There are no rail or warehouse facilities.

Greenwich has a public dock 250 feet front, no warehouse or rail connection.

Cos Cob has a public dock 250 feet front, no warehouse or rail facilities.

Mianus has a dock about 200 feet long, mostly leased to various parties.

Stonington and Stamford have no public docks.

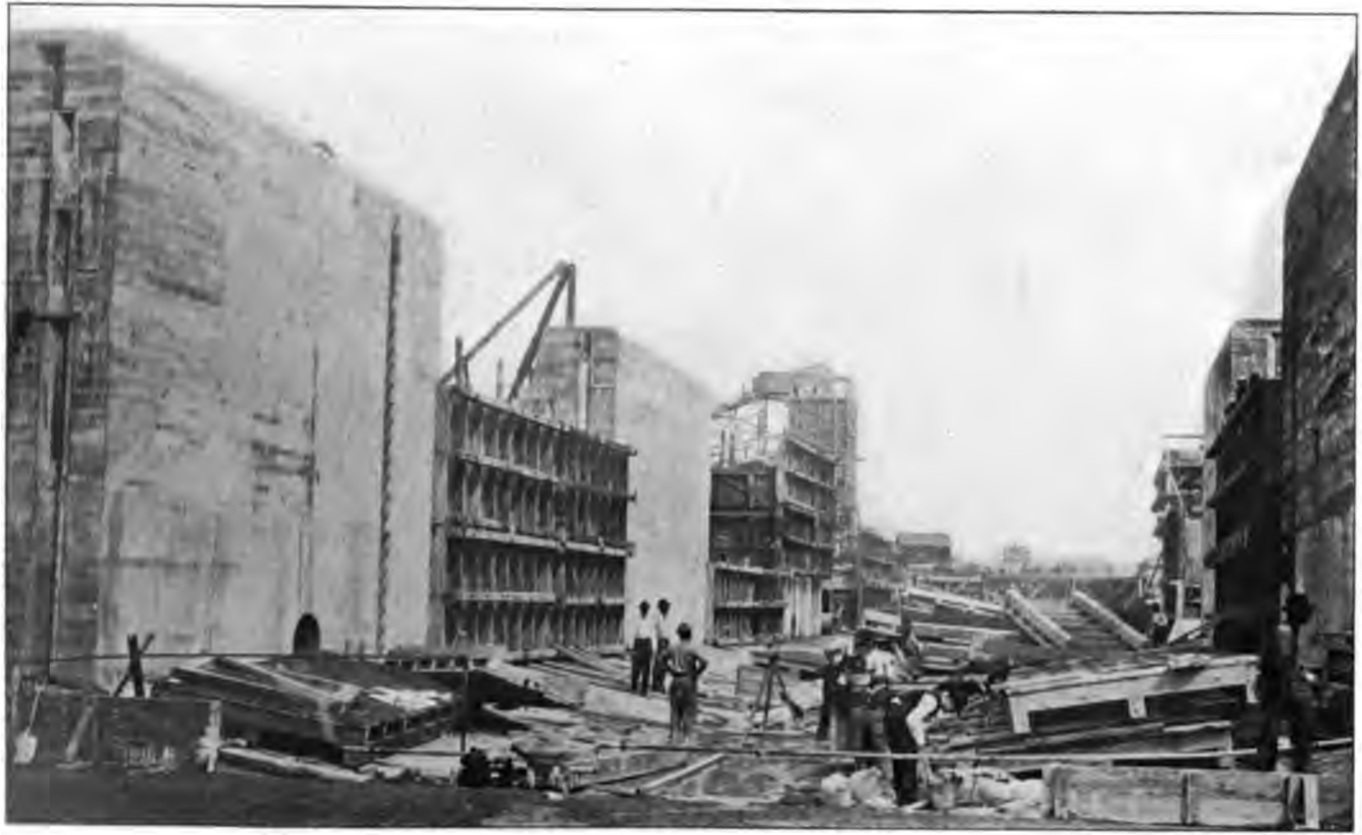
ATLANTIC INTRA-COASTAL WATERWAY.

In 1907 the Atlantic Deeper Waterways Association was formed by merchants, manufacturers, shippers and business men for the purpose of working for a protected route from Boston to Jacksonville, Florida. The Association has held conventions in Baltimore, Norfolk, Providence, Richmond and New London. Through its efficient President, the Hon. J. Hampton Moore, M. C., Pennsylvania, and his enthusiastic followers, surveys of the entire route have been made by the War Department Engineers, and favorable reports have been made to Congress for the greater part of the route. The completion of this magnificent waterway means a great deal to Connecticut, connecting the state as it will with Boston to the east and with Philadelphia and all the Chesapeake Bay cities, and even to the farthest south by a protected route, where shipping can find safe passage, where less costly boats can be employed in the movement of goods and insurance rates decreased, to say nothing of the great saving of time through the shortened route. All this will tend to expedite shipments, reduce hazards and decrease transportation charges, thus affecting every Connecticut port. The first link to be completed will be the Cape Cod Canal, which is being built by private capital, thus will not be toll free. This canal will be finished in 1913 and will be 25 feet deep with 100 foot bottom width, and it will also shorten the distance from Boston to New York appreciably. A warship passing through the canal would save 144 miles, while merchant vessels which traverse Long Island and Vineyard Sounds would save about 100 miles. The loss of life and property from 1843 to 1903 around this section of the New England coast is a good argument alone for the building of this canal. During those years 2,131 vessels were wrecked, 908 being total. Ten complete crews disappeared, and 700 fishermen and sailors have lost their lives.

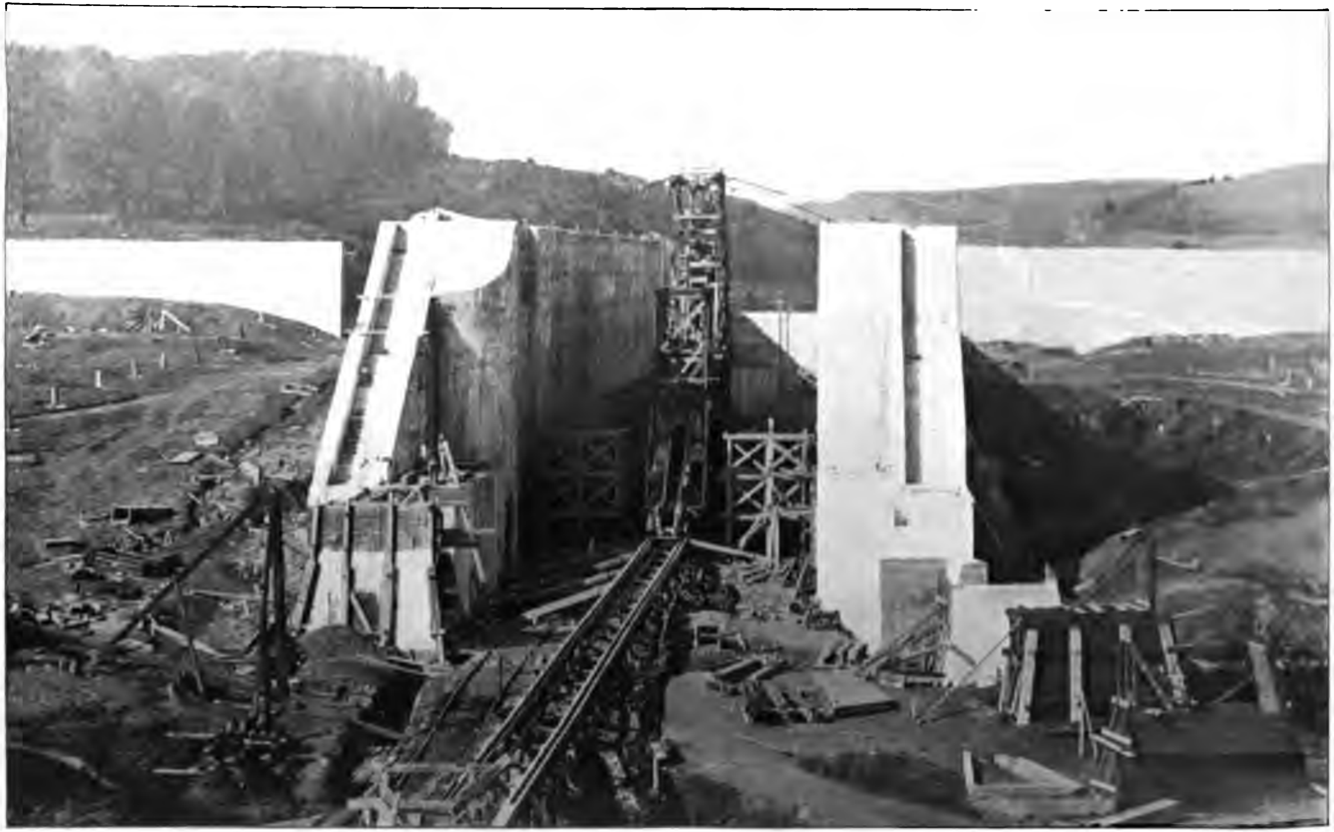
Long Island Sound in most cases is a safe waterway. Upon reaching New York and passing down the coast to round the Delaware Capes for Philadelphia, a distance of 167 miles will be saved by construction of the New Jersey Ship Canal. The State of New Jersey has already appropriated $500,000 to purchase the right of way and is quite likely to increase this amount. The Board of Engineers, U. S. A., approve building this canal upon completion of the Panama Canal. The building of this link would be of immense advantage to all New England on the cost of coal. After the boats are in the Delaware another canal, which was opened July 4, 1829, and now has a 9-foot draft, being known as the Chesapeake and Delaware Canal, is to carry them into the former bay, which means that such cities as Baltimore, Washington, Newport News, Norfolk and Richmond will be brought miles nearer New England. The Board of Engineers also recommend the purchase and deepening of this canal by the Federal Government. It is a very important link because it will save a distance of 325 miles in going from Philadelphia to Baltimore. After Hampton Roads is reached the route is by Albemarle and Chesapeake Canal to Albemarle and Pamlico Sounds and out below Capes Hatteras and Lookout, into the usually calm southern waters. The Albemarle and Chesapeake Canal purchase and improvement was authorized in the last Rivers and Harbors bill and the work below has already been provided for. Thus a great work is well started and Connecticut should watch it, help it, and prepare to benefit by its completion.

ERIE CANAL OR NEW YORK STATE BARGE CANAL.

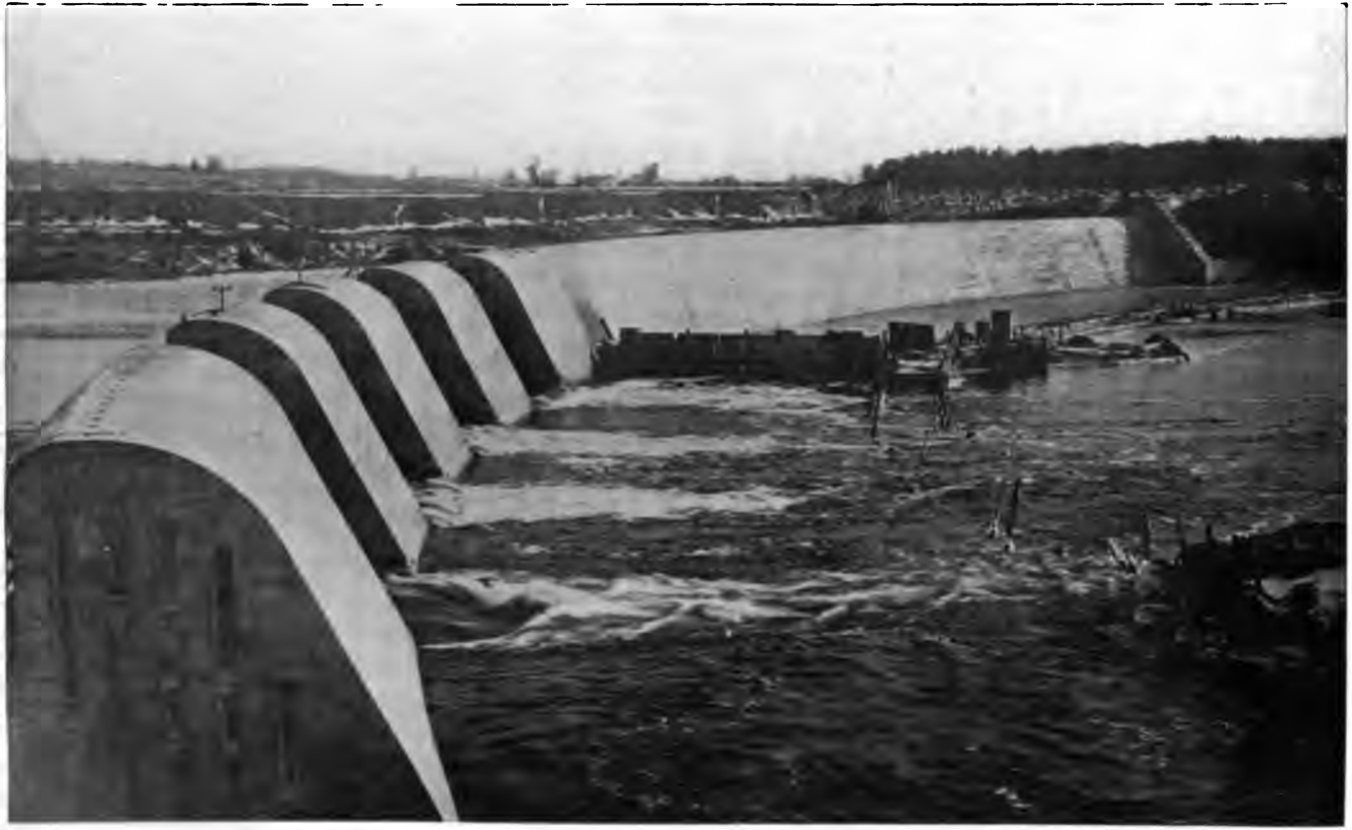
In our last report we paid particular attention to foreign terminal conditions. In this one we desire to call attention to what a neighboring state is doing in canal construction. The pictures herewith shown will



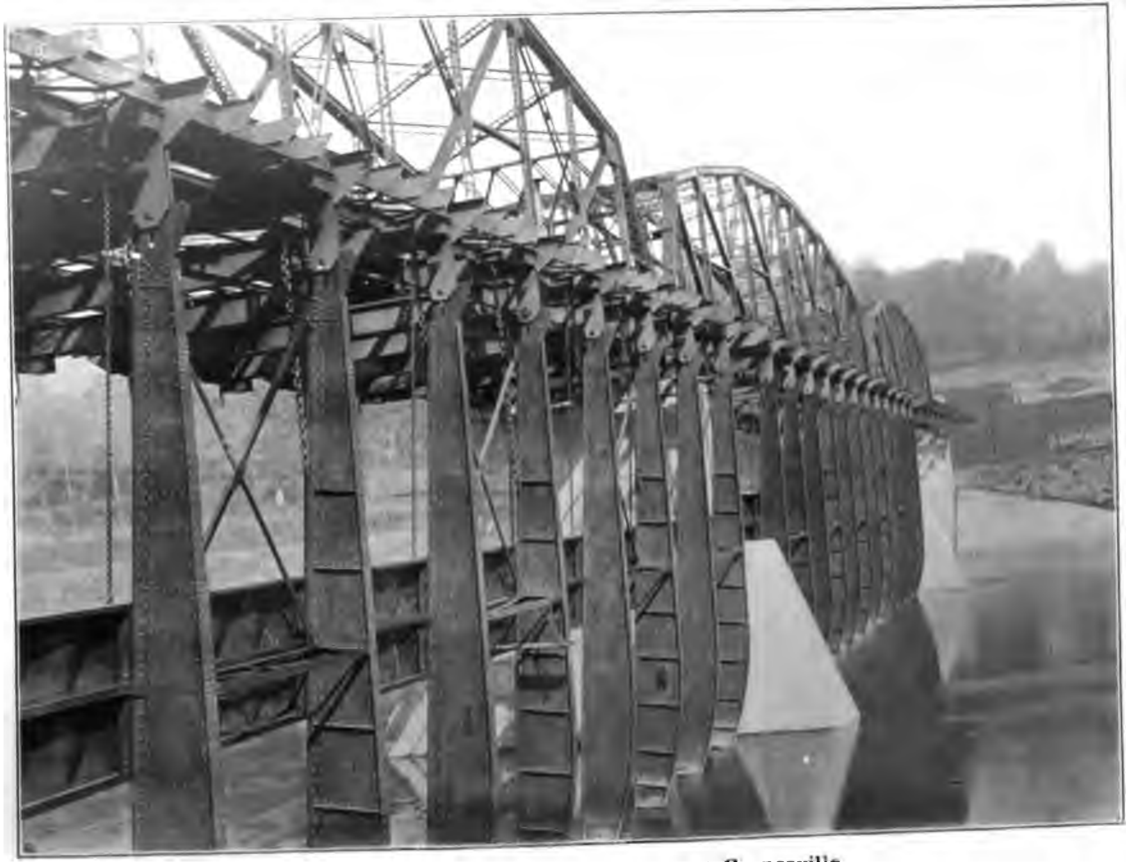
Lock No. 8, Champlain Canal, near Fort Edward, showing side walls in process of construction.



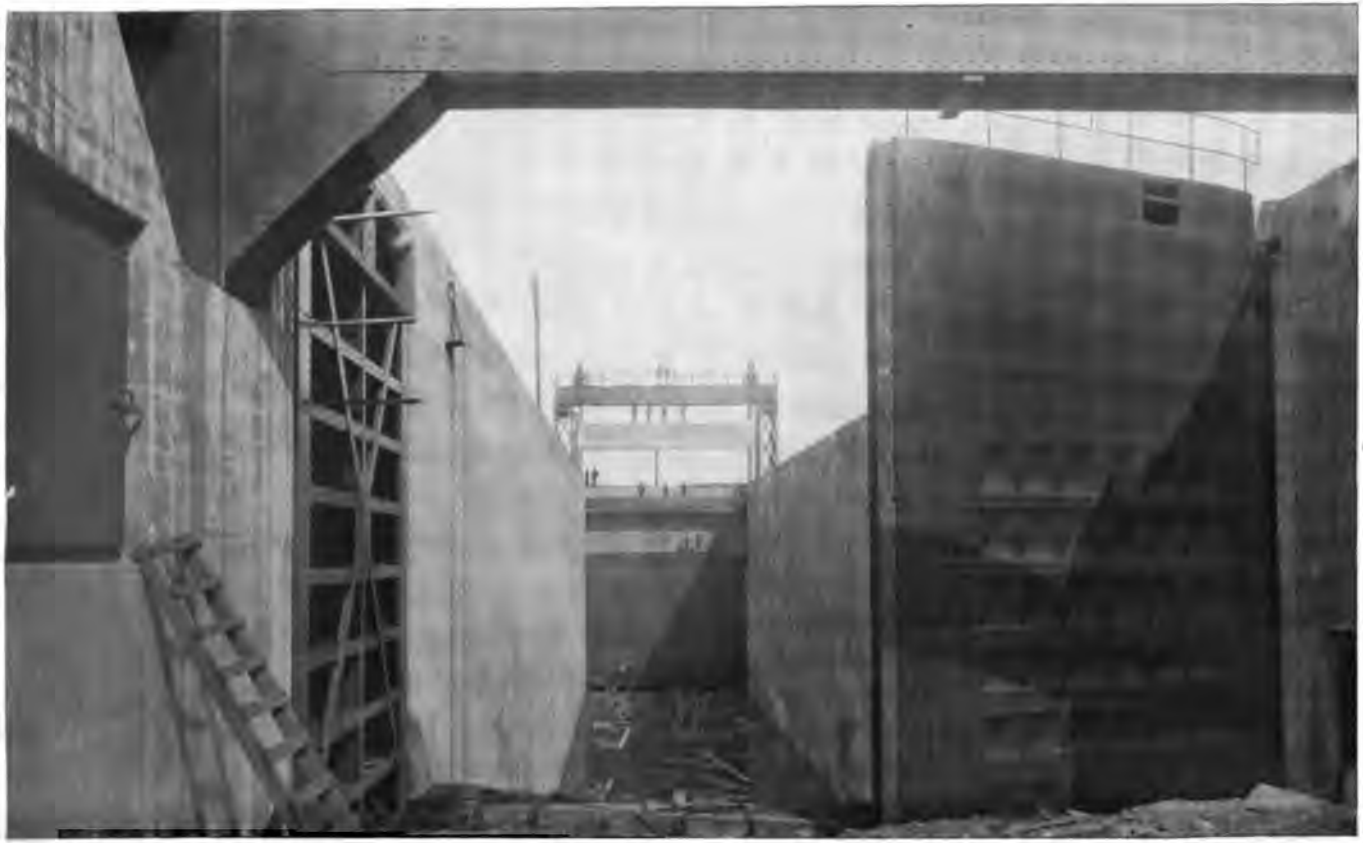
Lock No. 5, near Waterford, nearly completed. The Machine in Chamber is part of a Belt Conveyor used for Carrying Mixed Concrete about 700 feet from Mixer to Lock. On left is Core Wall, marking the confines of the Pool.



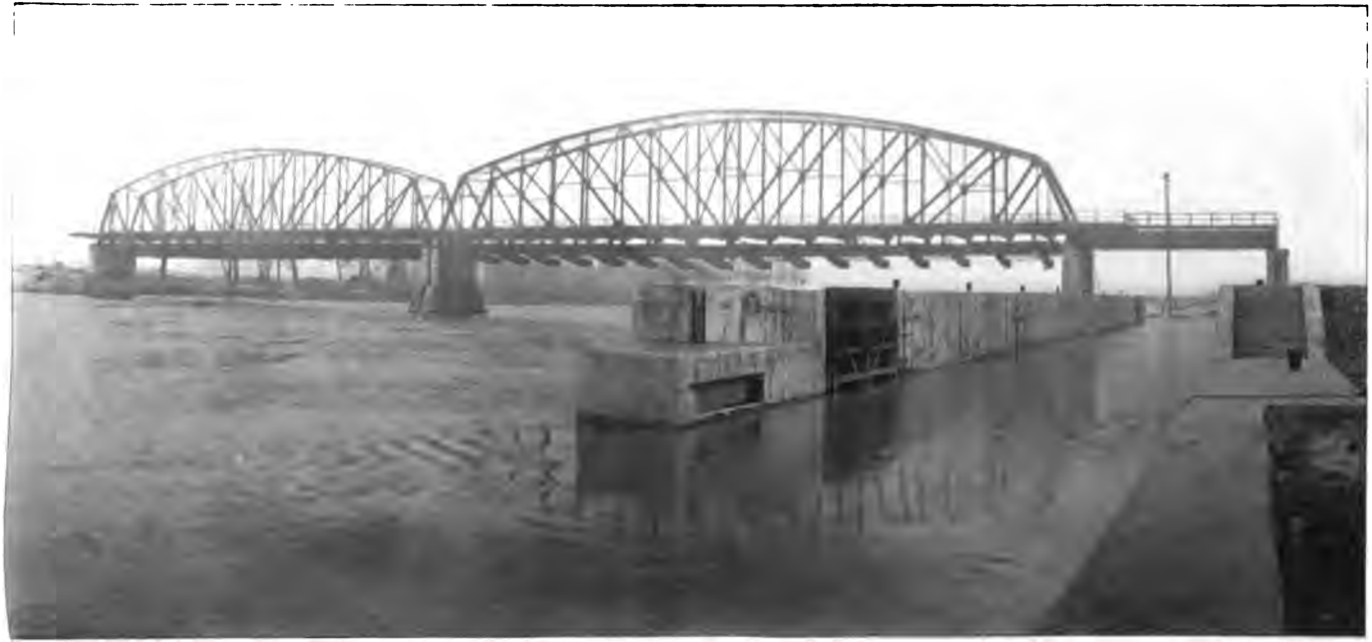
Eastern Portion of Crescent Dam at foot of Mohawk River Navigation.



Nearby View of the Movable Dam at Cranesville.
Showing Details of Construction.



Lock No. 17, at Little Falls, of 40 1-2 feet Lift. The lower gate of lift type, is seen in the closed position. The high side walls and the closed upper gate make the lock look narrower than the standard width, which is 45 feet.



General View of Lock and Movable Dam, Bridge Type, at Tribes Hill.
Gates and Uprights raised, ready for floods or winter.

portray vividly the gigantic work, and we say gigantic because it is one of the greatest of present-day engineering feats.

The original Erie Canal was commenced July 4, 1817, and completed November 4, 1825. Its construction, brought about by the energy and foresight of Governor DeWitt Clinton, was responsible in bringing New York into direct communication with the middle west and subsequently brought a great gain of trade and wealth for the entire state.

Finding that the old canal was inadequate to meet present-day requirements, it was decided by the people of the state exercising the right of referendum, to authorize the new canal in 1903, at a cost of $101,000,000. The canal, unlike the Erie, makes use of the Mohawk river to a point near Rome, New York, by the construction of dams, thus creating slackwater navigation. Elsewhere it diverges from the old route, particularly near Syracuse, where it utilizes the natural waterway, Oneida Lake, reaching Onondaga Lake, which will be used as the harbor of Syracuse by a branch canal.

Aside from this appropriation $7,000,000 has been authorized for the Cayuga and Seneca Canal and $16,000,000 for terminals, some of which will be located in Greater New York.

We are indebted to Mr. A. J. Bensel, State Engineer and Surveyor of New York, for use of the pictures herewith shown.

We append a table of facts concerning this great undertaking and desire to point out that upon its completion, about two years hence, another opportunity will be afforded to Connecticut to extend her water transportation business if the people are eager to do so.

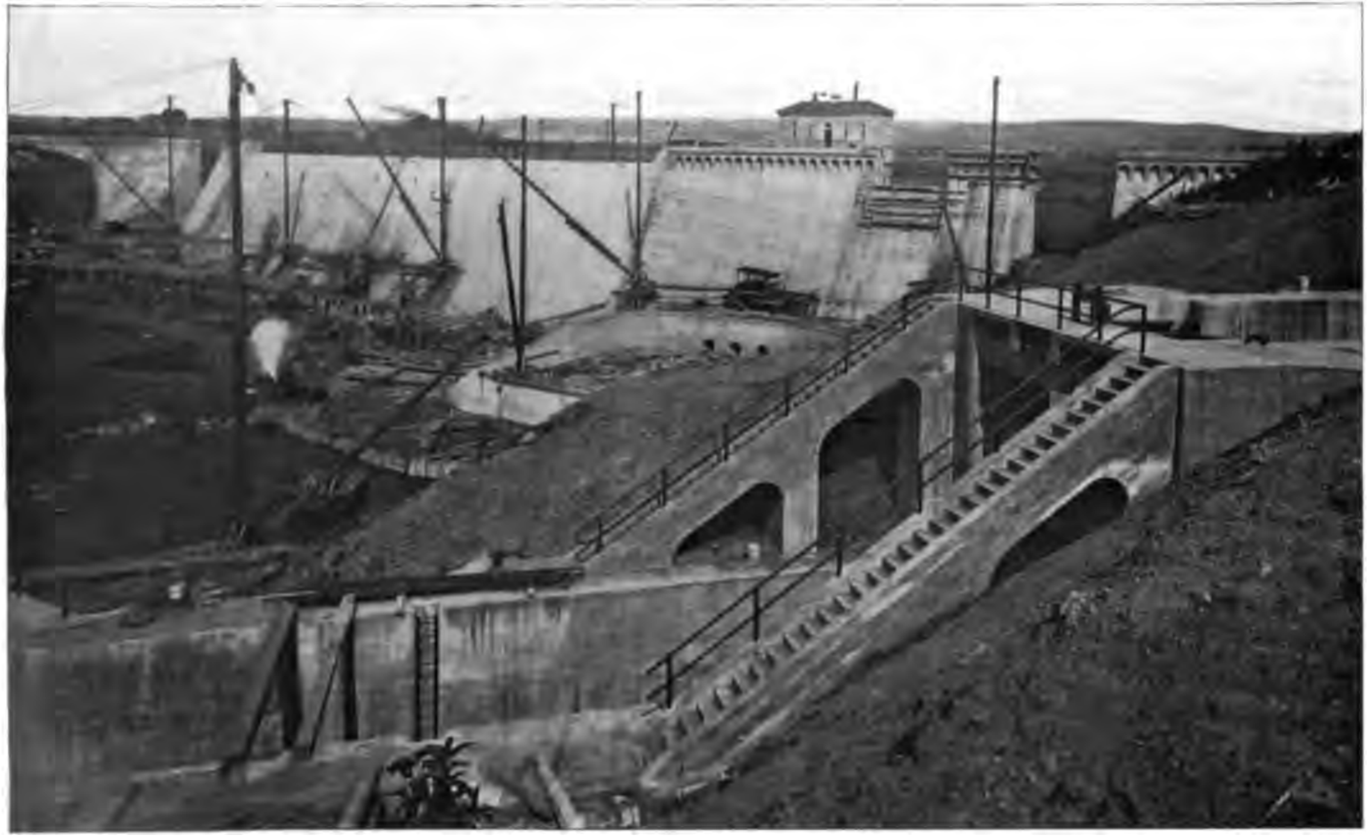
STATISTICS—BARGE CANAL.

Erie branch, length of canal, not including Hudson and Niagara river termini	323.2 miles
Erie branch, number of locks	35
Oneida branch, not included in above mileage, no improvement needed, about	19 miles
Spurs to Erie branch, (Syracuse and Rochester Harbors)	10.26 miles
Champlain branch, length of canal	61.5 miles
Champlain branch, number of locks	11
Oswego branch, number of locks	7
Oswego branch, length of canal	22.3 miles
Cayuga and Seneca branch, length (including spurs at head of lake), approximate	27.3 miles
Cayuga and Seneca branch, number of locks	4
Width of channel, land line, earth section, bottom, minimum	75 feet
Width of channel, land line, earth section, water surface	123 to 171 feet
Width of channel, land line, rock section, bottom, minimum	94 feet
Width of channel, river line, bottom, generally	200 feet
Depth of channel, land line and minimum river line	12 feet
Locks, length between gates	328 feet

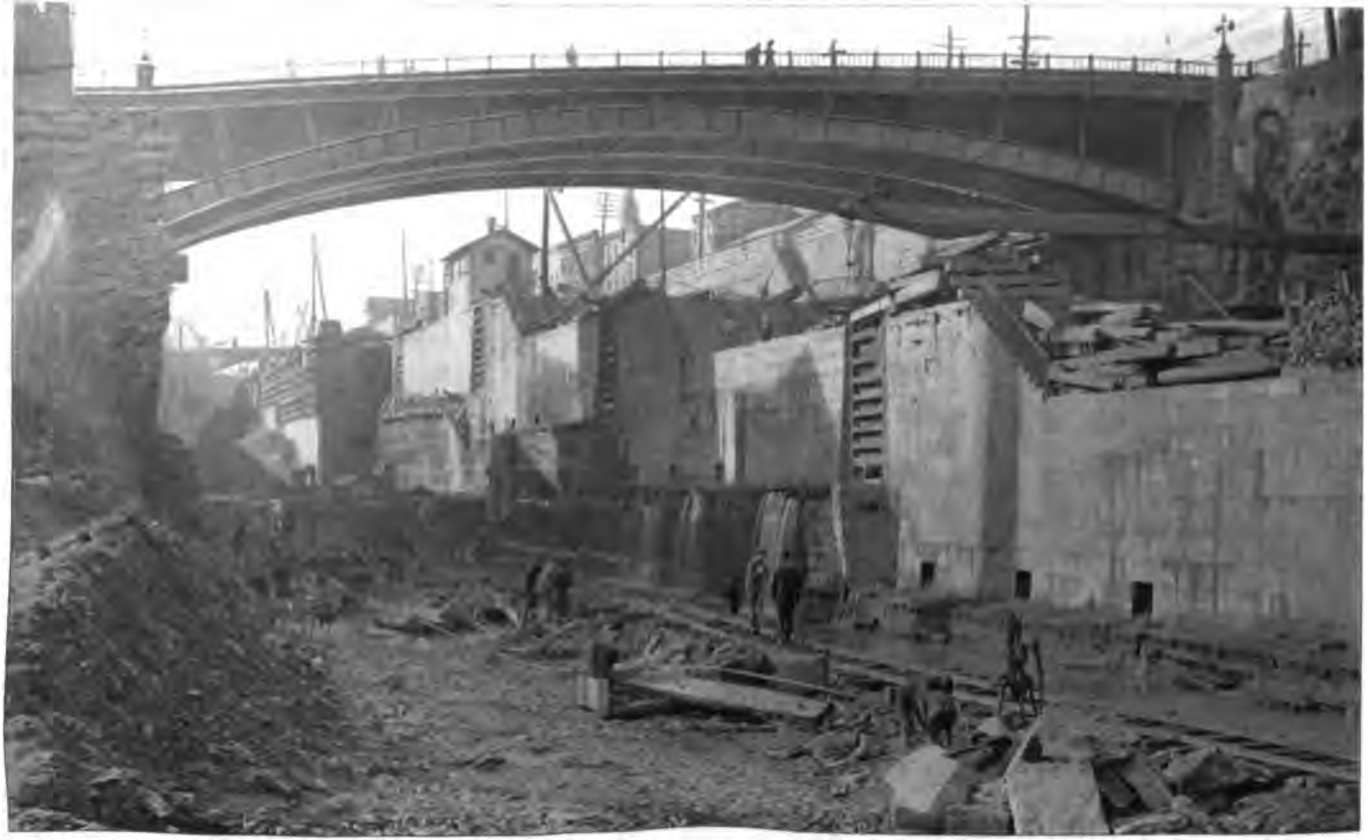
Locks, available length	310 feet
Locks, width of chamber	45 feet
Locks, depth of water on sills	12 feet
Dams, new	28
Dams, old with new crests	6
Dams, old used without change	5
Bridges	190
Boats, capacity, utilizing full lock width—about 3,000 tons restricted channel, and for two, travelling tandem, to be locked at one lockage—about 1,600 tons.	
Authorization of work (Erie, Champlain and Oswego Canals), Chapter 147, Laws of 1903.	
Authorization of work (Cayuga and Seneca Canal), Chapter 391, Laws of 1909.	
Appropriation (Erie, Champlain and Oswego Canals)	$101,000,000
Appropriation (Cayuga and Seneca Canal)	$7,000,000
Construction work began (Champlain Canal)	April 24, 1905
Construction work began (Erie Canal)	June 7, 1905
Excavation preliminary (1903) estimate, not including work for dams, bridges, highways, railways and stream changes and other small items (Erie, Champlain and Oswego Canals)	132,225,800 cu. yds.
Excavation contract plans (Erie, Champlain and Oswego Canals), approximate	100,580,000 cu. yds.
Excavation contract plans (Cayuga and Seneca Canal), approximate	9,100,000 cu. yds.
Concrete, preliminary (1903) estimate (Erie, Champlain and Oswego Canals)	3,243,100 cu. yds.
Concrete, contract plans (Erie, Champlain and Oswego Canals), approximate	2,800,000 cu. yds.
Concrete, contract plans (Cayuga and Seneca Canal), approximate	150,000 cu. yds.
Length under contract, January 1, 1912	423.8 miles
Value of work done on contract to September 1, 1912 (contract prices, including alterations)	$76,334,218
Value of work on contracts done to September 1, 1912	$49,000,000
Delta Reservoir, capacity	2,750,000,000 cu. ft.
Delta Reservoir, area of flow, crest height	4 1-3 sq. miles
Delta Reservoir, drainage area	137 sq. miles
Hinckley reservoir, capacity	3,445,000,000 cu. ft.
Hinckley reservoir, area of flow, crest height	4.46 sq. miles
Hinckley reservoir, drainage area	372 sq. miles

PROPOSED NEW BRITAIN-MIDDLETOWN CANAL.

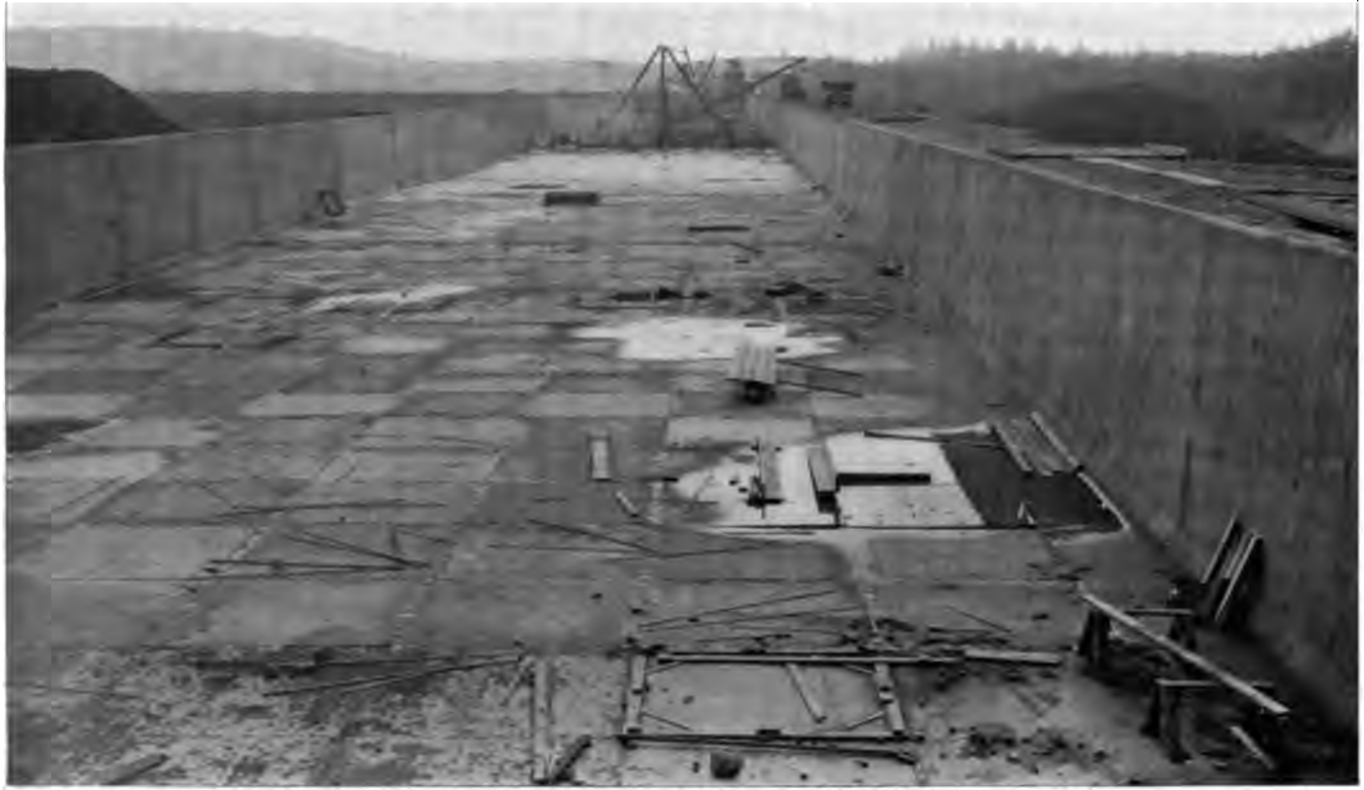
A glance at the map indicates a river running in a northwesterly direction from a point with its confluence with the Connecticut river, im-



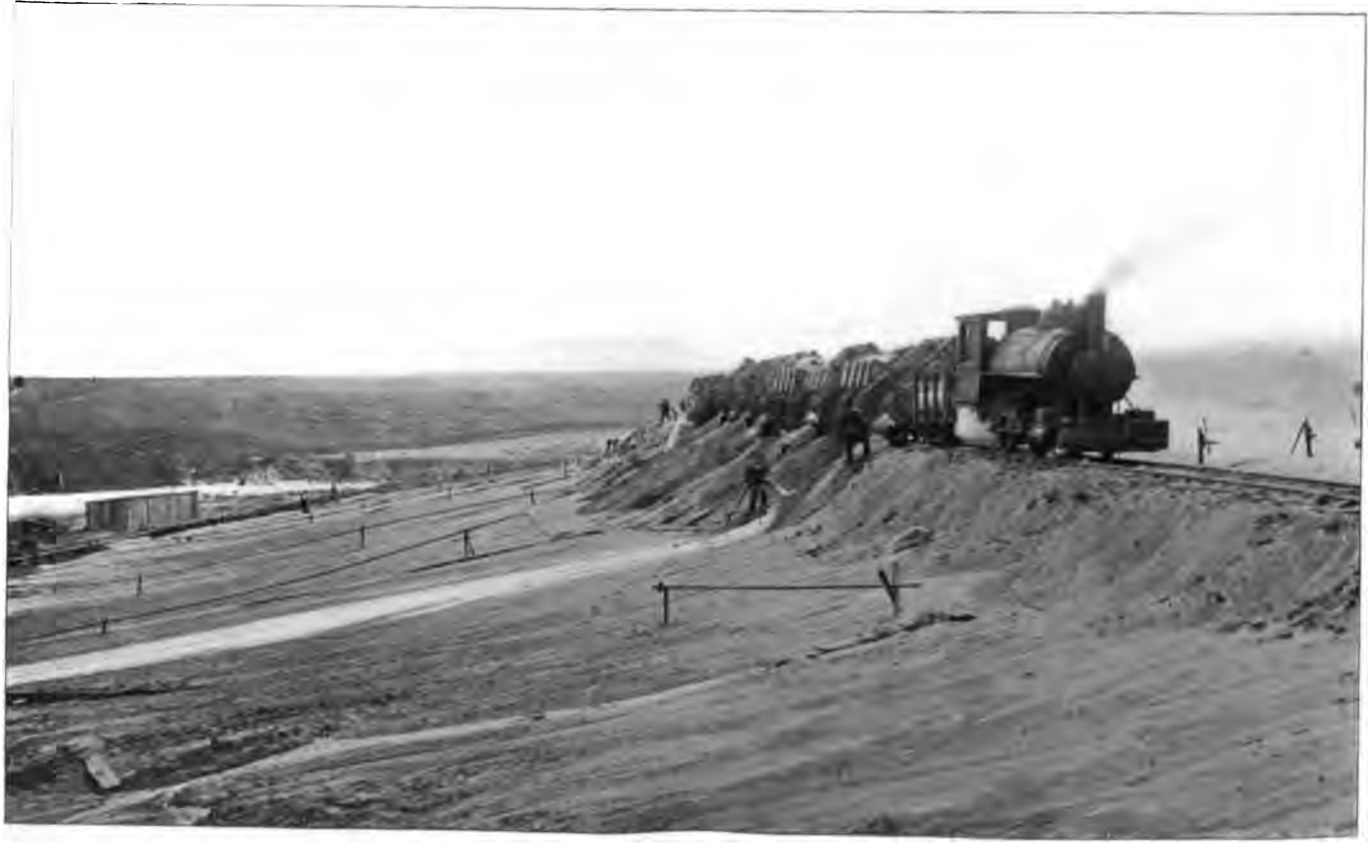
A View from Below Nearly Completed Dam, Delta Reservoir, showing in foreground portion of flight of Locks on Relocated Black River Canal, while just beyond is Discharge Pool and Outlet Pipes.



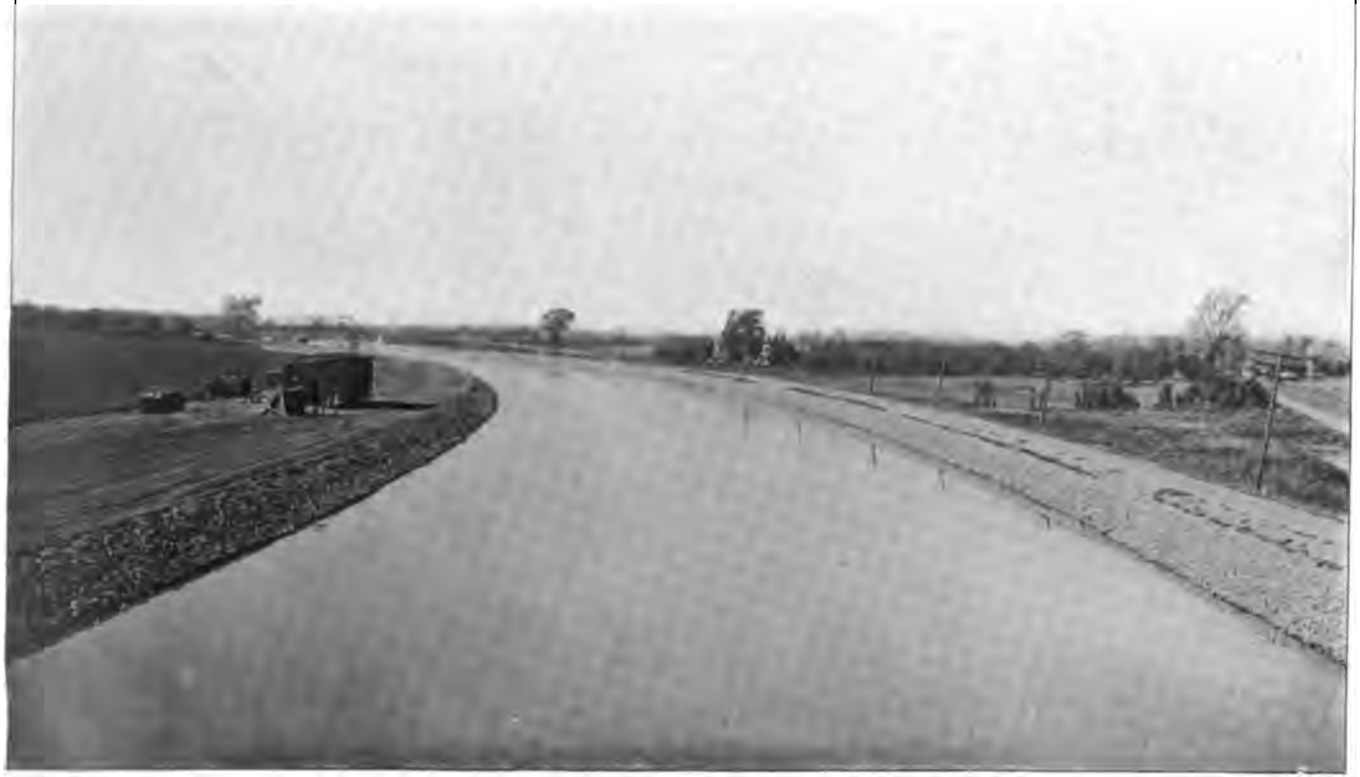
Construction of Two Locks at Lockport, having combined Lift of 49 feet. In present Canal there is flight of five double locks. The new locks replace the south tier, the north tier caring for navigation during construction, and are to remain for small boats.



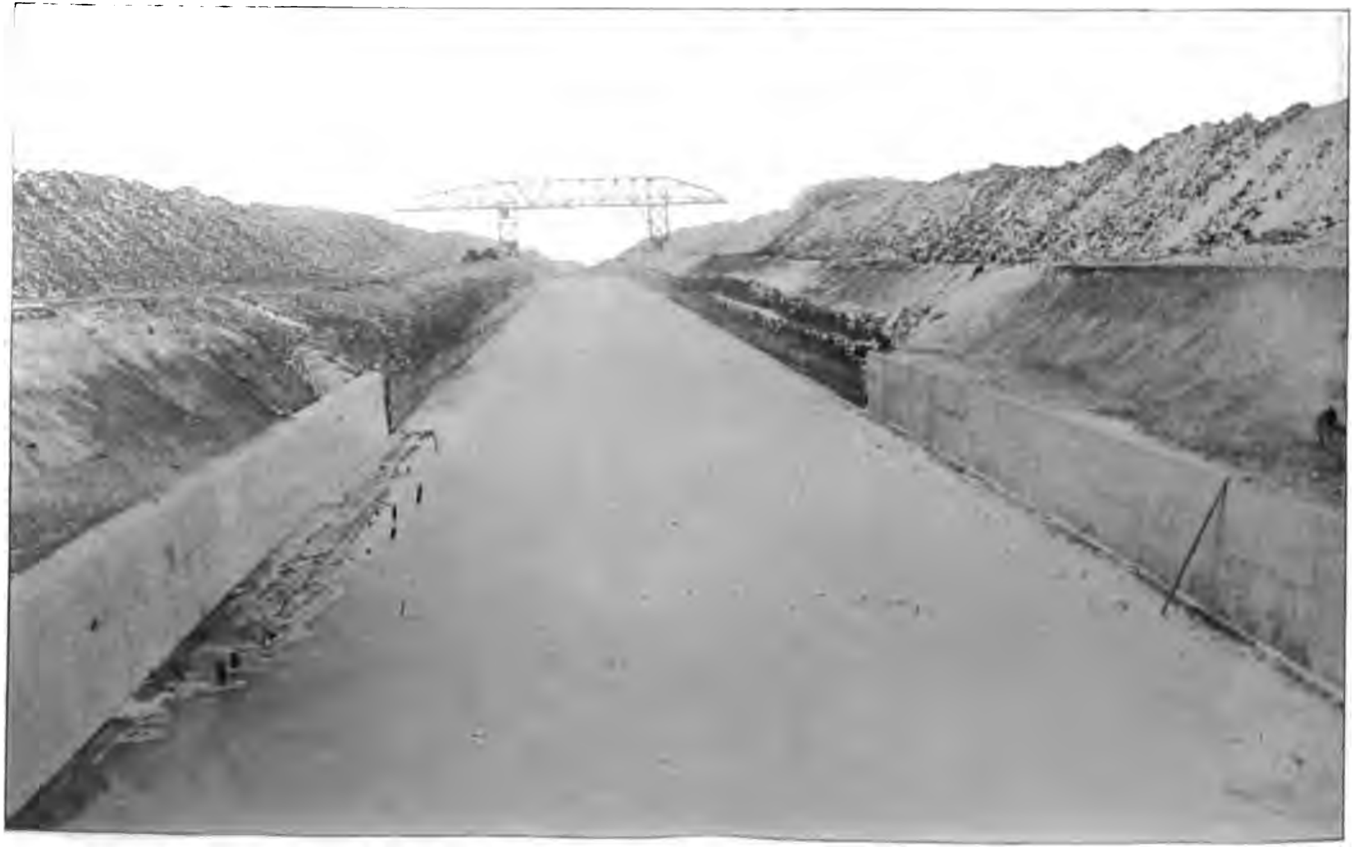
Completed Concrete Trough upon the Irondequoit Embankment. The sides and bottom are concrete.



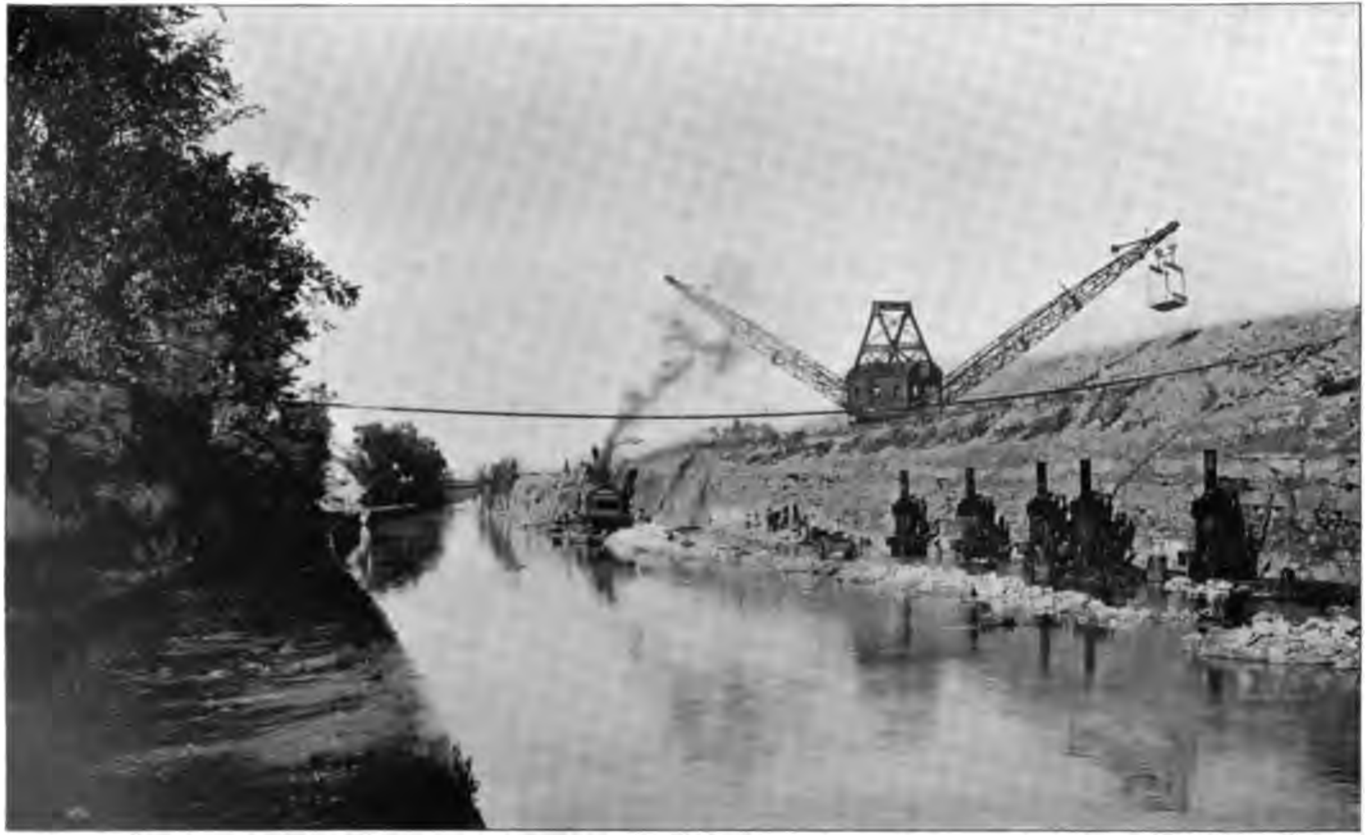
Formation Embankment at Irondequoit Creek, near Rochester.
Material being hauled in dump-cars and spread by water-jets.



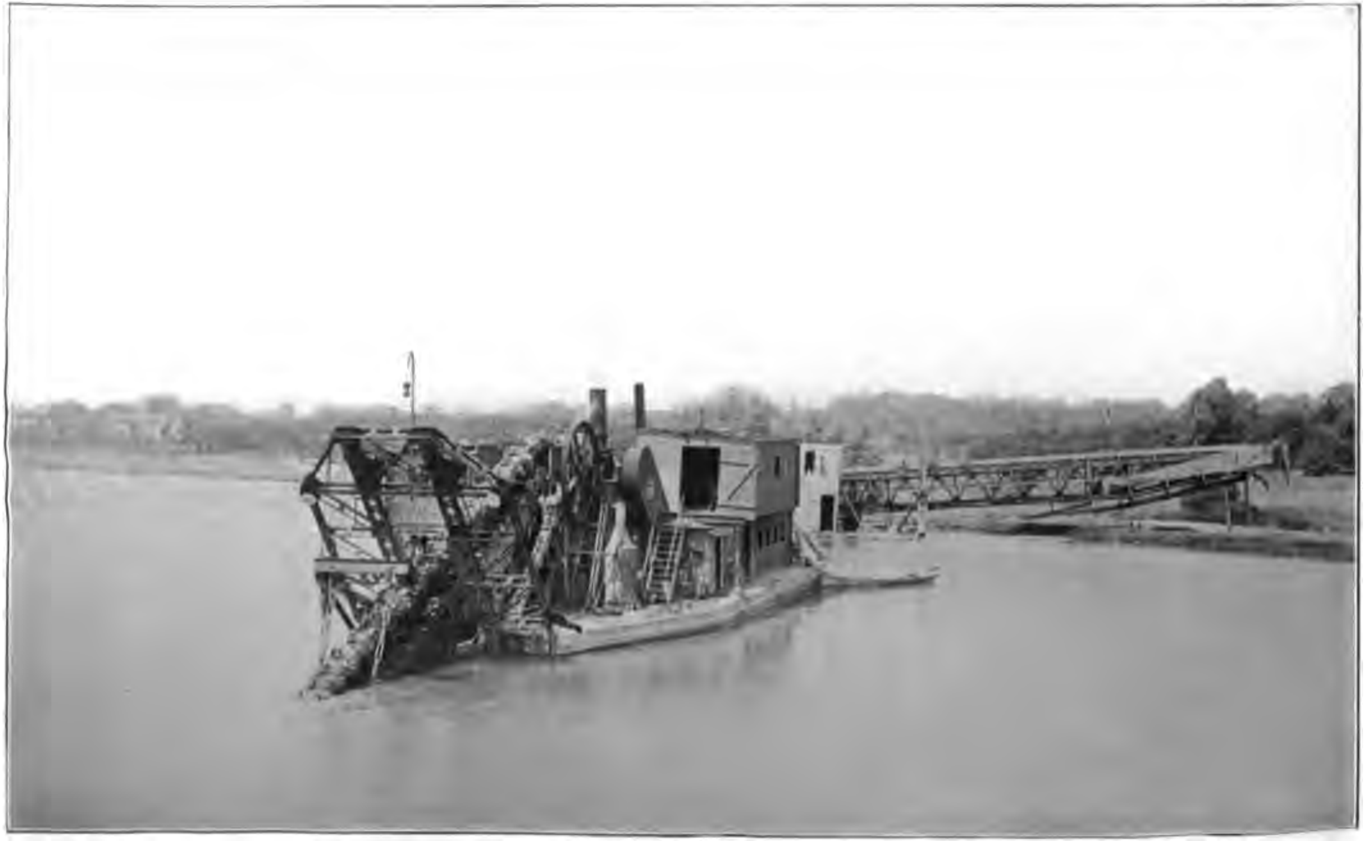
Completed Channel, typical of the Rochester-Lockport Level, where in general the alignments of the Barge Canal and the present Erie Canal are identical.



Section of Channel near Rochester, with Vertical Walls in Foreground and Rock Excavation, channeled below water line.



Double-boom Conveyor, Steam Shovel and Battery of Channelers Widening the Canal in Rock Cut West of Lockport, down to water level, during the navigation season.



View of Ladder Dredge, showing Belt Conveyor Device for Carrying Excavated Material to spoil bank.

mediately north of the City of Middletown. This river is indicated on the United States Geological Survey map as the Sebethe, but is known to the people of central Connecticut as the Mattabessett. It passes through or bounds the towns of Middletown, Cromwell, Berlin, Newington and City of New Britain, being formed by a number of small streams of good volume. For about six miles up from its mouth it winds through lowlands, marshy in many places; tidewater being noted this entire distance, which is to a point in East Berlin. From this point to New Britain the character of the country through which it flows is of a more rugged nature, the four miles more or less finding itself between narrow banks, rocky in some cases, with gravel and clay in others. The maximum rise in the contours in this distance is about 55 feet. It is obvious to anyone acquainted with canal construction that there is not a serious obstacle to overcome in the total distance of about ten miles.

The City of New Britain authorized a survey of the most feasible route for a canal through this valley by Hall & Bacon, and have furnished this Commission with blue-print maps of the same, consecutively numbered, noting all detail as well as property ownership, the city retaining the original drawings and profile.

Under date of November 20, 1912, the city forwarded to this Commission the following communication:

To the Rivers, Harbors & Bridges Commission, State of Connecticut:

November 20, 1912.

WHEREAS, The City of New Britain has authorized the survey of the Mattabessett river from Middletown up to New Britain, in contemplation of a barge canal to be built in this location and

WHEREAS, The City of New Britain has turned over to the Rivers, Harbors and Bridges Commission of the State of Connecticut duplicate drawings of said Mattabessett river and profiles preparatory to said Commission making a layout for said canal and an estimate of cost:

THEREFORE, the Common Council of the City of New Britain does hereby go on record as favoring the said proposed canal and asks your cooperation in obtaining the necessary action by the General Assembly of the State to secure the same.

NEW BRITAIN, CONN., November 22, 1912.

This is to certify that the above is a true copy of resolution passed by the Common Council of the City of New Britain, at its meeting held November 20, 1912.

ALFRED L. THOMPSON,
Deputy City Clerk.

The Chairman and Commissioner Cadwell have inspected the route on several occasions, once officially, and the Commission at a meeting authorized further examination of the proposed route so that a preliminary estimate of the cost can be made, including all excavation, building of embankments, locks, spillways, syphons, bridges, changes of highways and railroad.

REPORT OF

State Board of Civil Engineers

APPOINTMENT OF STATE BOARD OF CIVIL ENGINEERS.

In accordance with Chapter 231, of the general statutes of the legislature of 1911, approved August 30, 1911, the following engineers were named to act as a State Board of Civil Engineers:

First Congressional District—Luther W. Burt, C. E., 39 Pearl Street, Hartford, Conn.

Second Congressional District—Edwin W. Bush, C. E., Lyme, Conn.

Third Congressional District—Albert B. Hill, C. E., 100 Crown Street, New Haven, Conn.

Fourth Congressional District—Horace G. Scofield, C. E., 946 Main Street, Bridgeport, Conn.

Fifth Congressional District—William G. Smith, C. E., 51 Leavenworth Street, Waterbury, Conn.

The above engineers, together with the engineer member of the Rivers, Harbors and Bridges Commission, William H. Cadwell, C. E., 213 Main Street, New Britain, Conn., constitute the Board of Civil Engineers.

The first five engineers were appointed on the third day of April, 1912, for a period of two years, or until their successors are appointed and qualified.

The object of said Board of Civil Engineers is to pass upon all questions relating to the construction and safety of all dams in their respective congressional districts in accordance with existing statutes.

Each of the members of the said State Board of Civil Engineers have made complete report of all inspections made by them since their appointment, which reports are on file in the office at the State Capitol.

Said reports in several instances include complete blue-prints of the work inspected, also photographs of the work during progress; they also show the importance of this branch of state inspection.

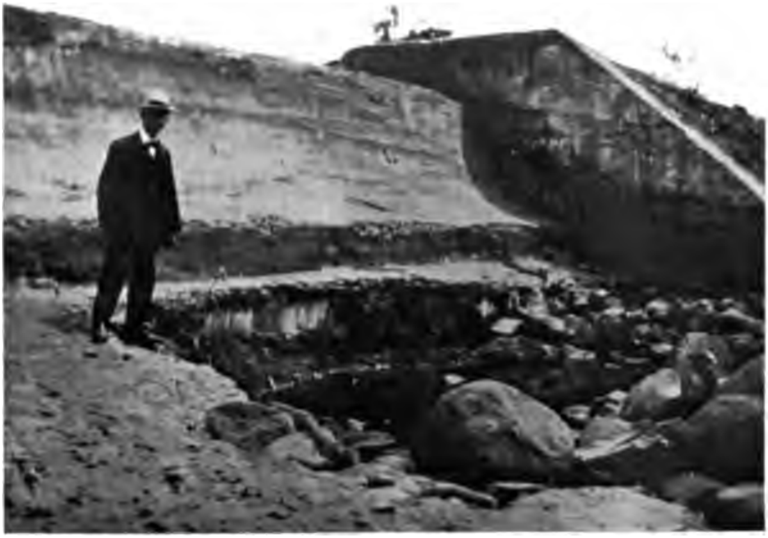
Your attention is respectfully directed to the views of dams in connection with this report, again forcibly demonstrating the need of exercising close supervision of all work of this character. We believe a number of changes should be made in the statutes to strengthen the same, as follows:

First. We believe additional legislation should be passed, increasing the duties and defining the authority of the said State Board of Civil Engineers, making it mandatory that all alterations, repairs, and additions, as well as new work, be reported to the engineer of each Congressional District by the owner, or owners, prior to the starting of any alterations, additions, repairs, or new work, and that plans and specifications be filed with the engineer prior to consent being given for the carrying out of any new work on dams that come under the general supervision of the said State Board of Civil Engineers.

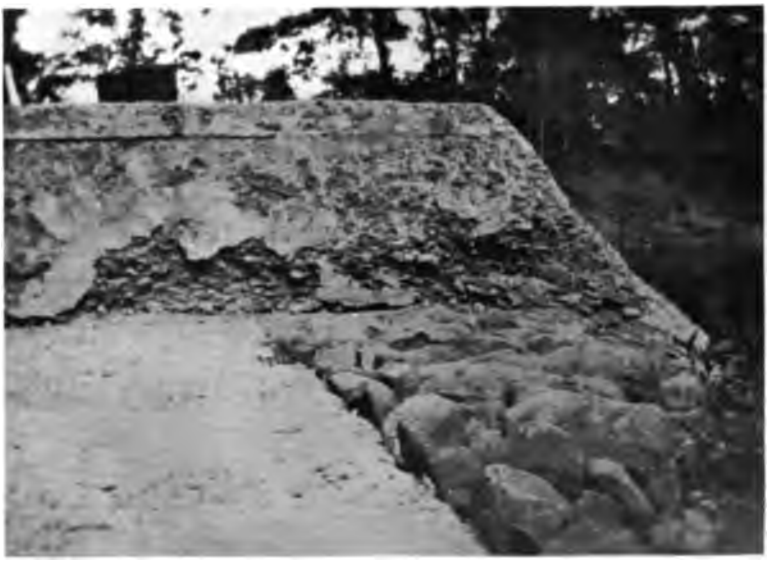
Second. That complete biennial reports be made to this commission, with full details and plans of all work inspected, approved, or otherwise, by each of said State Board of Civil Engineers, and that in important work—work of large magnitude, or risk—the opinion of the majority of said State Board of Civil Engineers shall be required in writing before consent shall be given to proceed with the work.

THIRD. That records of all future inspections, permits, plans on tracing paper, etc., be kept in the Commission's office.

WILLIAM H. CADWELL, C. E.,
Engineer member of the Rivers, Harbors and Bridges Commission.



Damage done by Freshet. Dam near Meriden, Conn.



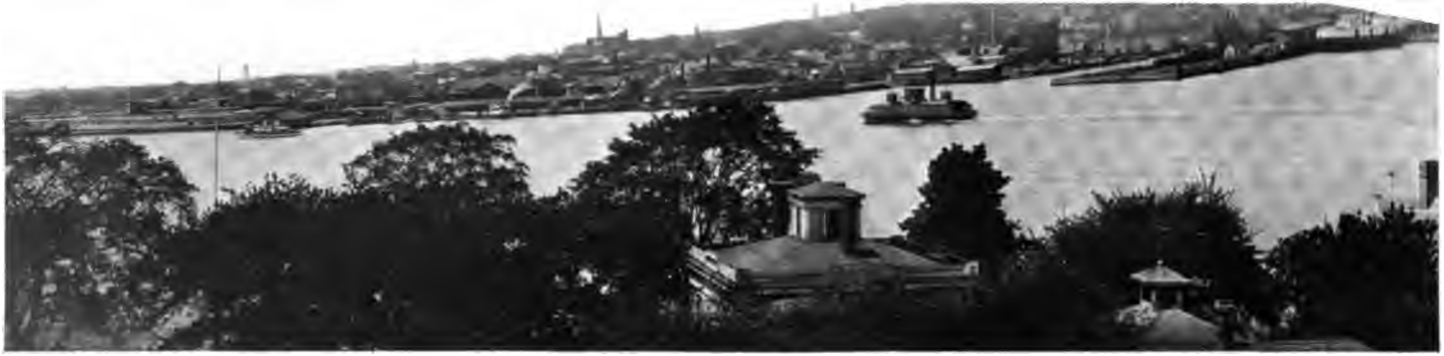
Defective Concrete Work on Wing Wall. Dam near Meriden, Conn.

Showing New Dam at Meriden from upstream side.
Note size of Spillway.

Inadequate Spillway of Dam near Meriden, Conn.

New London Steamship Terminal.

For that portion of the Commission's work dealing with steamship terminals at New London, the Governor, and the Mayor of New London are ex-officio members of this Commission.



Looking from Groton toward New London.

Central Vermont Pier at extreme right, New England Steamship Co. Pier, extreme left.

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NEW LONDON STEAMSHIP TERMINAL.

The bill authorizing the expenditure of state money for improvements for expediting the interchange of rail and water traffic in or near the City of New London.

SECTION 9. "Said commissioners shall not carry into effect the provisions of the preceding sections (viz., the construction of said improvements) until, after proper investigation, they shall have found that said improvements will, in their judgment, be for the commercial advantage of the state."

This provision placed upon the shoulders of the Commissioners the task of investigating ocean terminal conditions throughout the eastern seaboard.

Accordingly subcommittees were appointed, and the cities of Portland, Maine, Boston, Providence, New York, Baltimore and Philadelphia were visited.

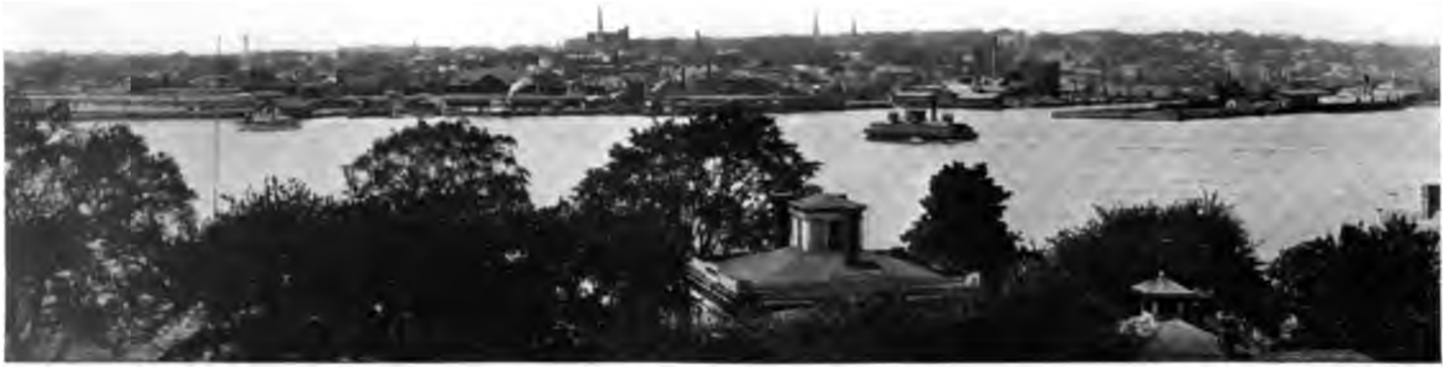
In each city we found that the ocean terminal facilities were considered one of their most valuable assets.

We were given most hospitable receptions in every case, and every possible facility was accorded us in our investigations.

To go into the thousand and one details of our findings in each city is perhaps superfluous in a report of this kind where brevity is valuable.

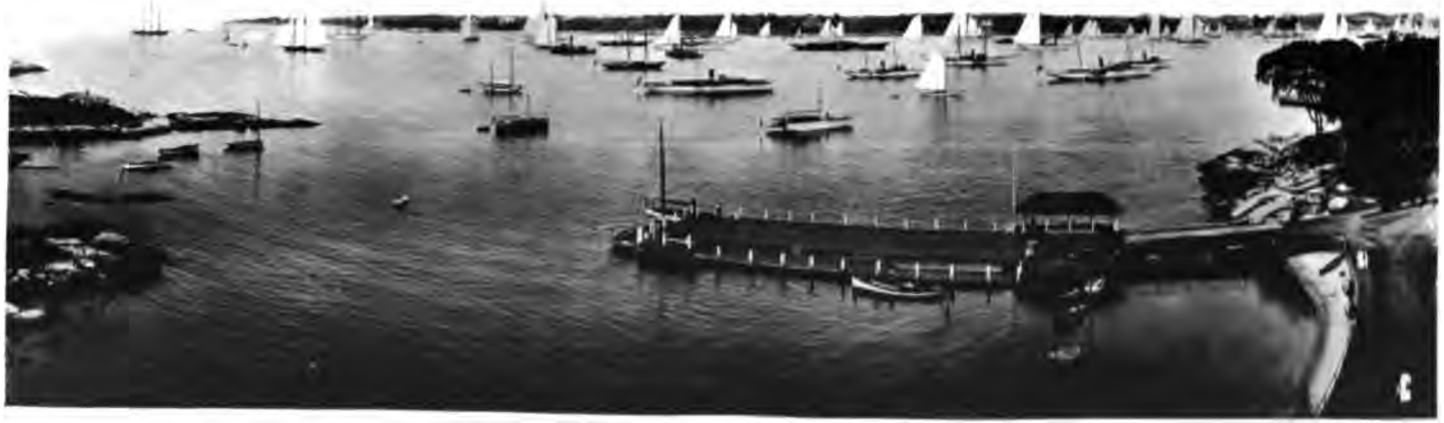
In Portland we found it to be the well-established belief that the ocean terminals there are the very life of the city, which has doubled in population since their establishment ten years ago. The principal piers and elevators are owned by the Grand Trunk Railway Company. Plans are on foot there for extensions in facilities under state or municipal ownership of new construction. There is no doubt of a tremendous increase in the value and importance of the port. We visited their grain elevators and docks, and were astonished at the amount and variety of freight awaiting transfer. Among the articles which we particularly noticed on account of their quantity were canned goods, hams and meats from Chicago for export, and a large assortment of miscellaneous goods from western United States and Canada. It is probable that with equal harbor facilities New London may reasonably expect a large amount of a similar class of business. We were taken down the harbor of Portland in a steamer, and noted the number of large schooners, steamers and commercial vessels at anchor. There were two steamers in port unloading and six were bound for port. The harbor was frozen over as far as the eye could see, and it was necessary for the steamer to break it up, proceeding under reduced headway.

At Boston we visited the piers, docks and railroad connections, and were taken on a trip down Boston Harbor, which gave us an excellent idea of the important part water facilities are playing in the development of that city. The millions of money being spent there by the state and by the city speak eloquently of the value of their maritime position. The development of that entire section of Massachusetts seems to depend on the increased prosperity of Boston, which prosperity in turn, is hand in



Looking from Groton toward New London.

Central Vermont Pier at extreme right, New England Steamship Co. Pier, extreme left.



Lower New London Harbor during visit of New York Yacht Club.

hand with water terminal improvements. Without these facilities Boston realizes that she will stagnate or slip back; with them she realizes that she can claim her place among the great cities of America.

At Philadelphia and Baltimore conditions are the same. Millions have been spent, and their expenditure has resulted in great and immediate benefit to their entire localities. At Philadelphia particularly, the splendid new piers and the excellent arrangements for transfer of freight are impressive. Although Philadelphia is located a long way from the sea, dredges have to be at work constantly during the months of open water, and powerful ice-breakers are owned and operated by the city during the winter months. Despite these disadvantages Philadelphia is a great port, growing and prosperous, and a leading factor, perhaps *the* leading factor in the development of Pennsylvania.

It is worthy of note that New London is free from the disadvantage of Philadelphia. Here we are near the sea; on account of the character of the bottom and the clear water flowing down the Thames river, dredging once done is done practically for all time; and we are never icebound.

New York is of course the leading port of America. To her sail ships of every flag, and from her gateway goes forth merchandise to every part of the world. New York is the only port in the United States that needs fear no competition. Having no fears of her prosperity, her views in regard to the development of nearby ports are most broad, and it was in New York that we found the best evidence that it would be to the advantage of Connecticut to develop New London. Every great port should have, back of its docks, a belt line of communication, leading not only from each dock to railroad connections, but also from dock to dock so that merchandise may be transported cheaply from one vessel to another. New York, being located on an island entirely covered by extremely valuable city property, has not the room and cannot afford to take the space necessary for a belt line. But as some sort of a belt line is absolutely essential, New York has found a substitute therefore in an enormously expensive system of lighterage. Millions of tons of material are transported not only from dock to dock, but from docks to railroad tracks by lighters. This costs so much money that it makes terminal charges at New York very high, and consequently tends to crowd out the classes of freight which demand low rates and cheap facilities.

Passenger service, broken cargo business, perishable goods and goods of great intrinsic value can stand these rates and do, in order to enjoy the advantage of the greatest port in America, but cargo-lots, bulk goods, raw products, etc., cannot, and these are the classes of freight that are trying to enter New York in vain, that are perplexing the shipping authorities there.

We found that thousands of tons of sugar were discharging from vessels in New York docks to lighters, was taken in the lighters to smaller steamers, carried up Long Island Sound to New London and there placed on cars for delivery to Canada. This is also true of South American hides. This expensive way of handling such bulk goods adds between ninety-five cents and one dollar per ton to the freight, every cent of which would be saved if the cargoes of sugar and hides could come direct into the port of New London. So interested were the people concerned in these shipments that they investigated New London's present facilities, after our visit, with a view to bringing sugar in at once, but there was not water enough at the docks to admit the ocean-going vessels. In this age of close competition, ten cents saving would bring the business to New London, and here we show a saving of nearly if not quite one dollar per ton.

These are but examples; others might be quoted. Grain alone offers a tremendous opportunity — not only Canadian grain from the great fields of northwestern Canada, but American grain, bound beyond the Atlantic via the new. barge canal from the Lakes. The new class of large barges which will bring grain and other merchandise from the American West via the Great Lakes, can come up Long Island Sound to New London with absolute safety, and at an additional cost of only about five cents per ton in freight rates. This five cents is only a small fraction of what it would cost to stop this merchandise at New York and submit it to the terminal charges there. So we were pleased to find that grain shippers of Buffalo were interested in the establishment of a port at New London and believed that business of this character would use the port in connection with Canadian grain shipments.

In New York our subcommittee was given an interview with one of the greatest financiers of the world, who is vitally interested in ocean business. He told us that the ocean terminals of the world today are unable to take care of the tonnage offered; that the great ports were all congested; that the trend of shipping therefore is towards the smaller ports; that with the opening of the Panama Canal the demand for terminals will perhaps double; that ships are being built for this increased demand, but that practically no adequate dockage is being prepared. He said to us that if we built docks they would be used from the start, and that in the building of ocean terminals we would find it an axiom that trade would follow the facilities.

The Chairman of the Committee on Piers for the Harbor of New York for the Maritime Exchange wrote us that we could make no mistake in the improvements of New London, "Because," he said, "New York cannot extend her facilities much further and cannot now keep pace with the increased demand."

Mr. Calvin Tomkins, New York's wise and far-sighted Dock Commissioner, told us that in his opinion New York would send enough business to establish us as a port. Mr. Tomkins has written an article on the development of New London that is as optimistic as if he were personally interested in our welfare.

Professor Edwin J. Clapp of New York University, Traffic Expert and now Special Traffic Commissioner of the Directors of the Port of Boston, who has made many investigations, appeared before the Commission in relation to terminal improvements and approved of the contemplated development of New London Harbor.

In short, the evidence in favor was so great that on July 9, 1912, your Commission, at a meeting with all present, passed the following resolution without a dissenting vote.

"Resolved by this Commission: That having, in pursuance of the powers and duties upon it conferred by virtue of the provisions of Senate Joint Resolution No. 216, made proper investigation of the subject thereof, this Commission finds that it will, in its judgment, be for the commercial advantage of the state to provide for such development of the port of New London, in the towns of New London, Waterford and Groton, as is authorized by the terms of said resolution, and to make reasonable expenditures for the purposes mentioned in said resolution."

Since then a consulting engineer, Mr. William T. Donnelly of New York, has been engaged. A resident engineer, Mr. Waldo E. Clarke, has been engaged, with a working force. Maps of New London's water-front and abstracts of real estate titles have been prepared, borings of the harbor have been taken, and we are able to report real progress so that in the early spring we may begin construction work.

In conclusion of this subject, we may say that as Maine has Portland, Massachusetts has Boston, Rhode Island has Providence, the State of New York has the City of New York and as Pennsylvania has Philadelphia, so may Connecticut soon say that she has New London as an ocean port and thus step into her proper rank among the North Atlantic seaboard states of the Union.

RECOMMENDATIONS.

The Commission recommends changes in the following laws:

Amendment to Section 4752 of the General Statutes concerning harbor-masters.

Amendment to Section 4756 of the General Statutes concerning the removal of vessels.

Amendment to Section 4788 of the General Statutes concerning the obstruction of navigation.

Amendment to Section 4754 of the General Statutes concerning the powers of harbor-masters.

Amendment to Section 4787 of the General Statutes concerning deposit of material in water courses.

Amendment to Section 4786 of the General Statutes concerning obstruction of water courses.

Amendment to Section 4769 of the General Statutes concerning disposal of refuse in navigable waters.

Amendment to Section 4767 of the General Statutes concerning speed of vessels and jurisdiction.

Amendment to Section 4801 of the General Statutes concerning salary of Board of Civil Engineers.

Amendment to Section 4803 of the General Statutes concerning increased powers of Board of Engineers.

Amendment to Section 4805 of the General Statutes concerning apportionment of compensation of Board of Engineers.

NEW LEGISLATION.

An Act concerning appropriating money for reveting and improvement of the Connecticut river.

An Act concerning the disposal of old vessels and other floating obstructions.

An Act concerning the alteration and repair of dams.

An Act concerning removal of materials from the waters of the state.

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